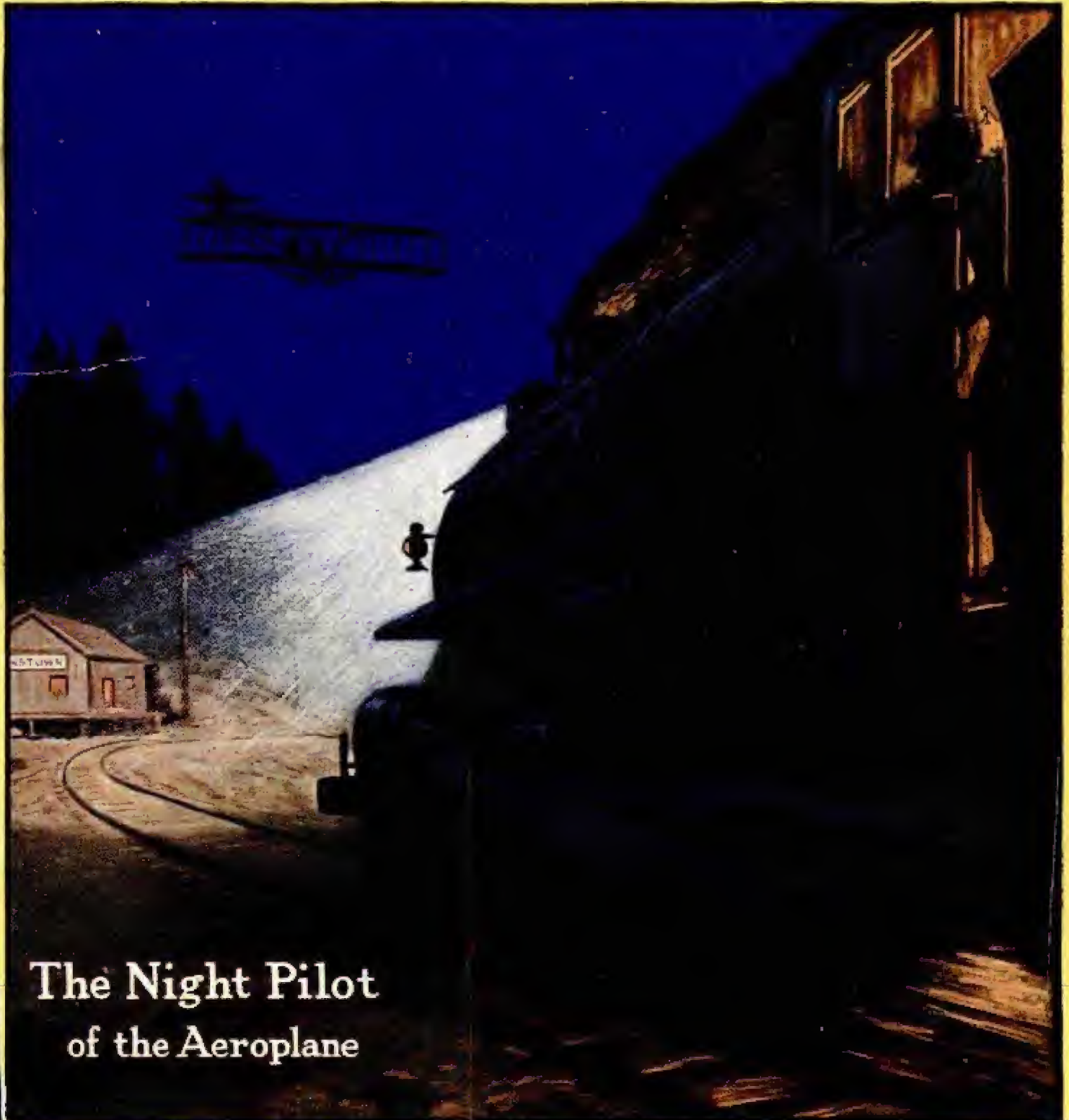


POPULAR MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT



The Night Pilot
of the Aeroplane



\$648

NEEDED TO BUILD THIS HOME!

Price includes Blue Prints; Architect's Specifications; Full Details; Working Plans and Typewritten Material List
OUR HOUSE DESIGN NO. 145

Our Design No 145 is positively one of the very best, economical, up-to-date, sensible and practical houses ever offered. There are many points about this neat house that must be studied carefully to fully appreciate its value. Neat in appearance. Easy to build. Low cost of labor. Easy to maintain after built, meaning little or no repairs. An ideal city or country home. An investment proposition that will net big returns.

Seven good-sized rooms and bath, pantry, inside cellar entrance, handsome stairway. Entire interior, including floors, finished in clear Georgia Pine, of up-to-date style and finish.

The material we furnish for construction is all BRAND NEW, selected with great care, excellent quality throughout, entirely suitable and in some localities almost too good for the purpose intended.

Our Guaranteed Building Proposition insures you ample quantities to complete the job strictly according to plans; prompt shipment, safe delivery and a personal follow-up letter from our President to find out whether our promises to you have been kept. Absolute satisfaction in the entire deal is what we offer.

We Save You Big Money on Lumber and Building Material!

The Chicago House Wrecking Co. is the largest concern in the world devoted to the sale of Lumber, Plumbing, Heating Apparatus and Building Material direct to the consumer. No one else can make you an offer like the one shown above. We propose to furnish you everything needed for the construction of this building except Plumbing, Heating and Masonry material. Write for exact details of what we furnish. It will be in accordance with our specifications, which are so clear that there will be no possible misunderstanding.

How We Operate

We purchase at Sheriffs' Sales, Receivers' Sales and Manufacturers' Sales, besides owning outright sawmills and lumber yards. Usually when you purchase your building material for the complete home shown above, elsewhere, it will cost you from 50 to 60 per cent more than we ask for it. By our "direct to you" methods we eliminate several middlemen's profits. We can prove this to you.

What Our Stock Consists of

We have everything needed in Building Material for a building of any sort. Lumber, Sash, Doors, Millwork, Structural Iron, Pipes, Valves and Fittings, Steel and Prepared Lathing. Our stock includes Dry Goods, Clothing, Furniture, Rugs, Groceries, etc., Machinery, Hardware, Wire Fencing—in fact, anything required to build or equip. Everything for the Home, the Office, the Factory or the Field, besides everything to wear or to eat. Send us your carpenter's or contractor's bill for our low estimate. We will prove our ability to save you money. **WRITE US TODAY**, giving a complete list of everything you need.

Free Book of Plans

We publish a handsome, illustrated book, containing designs of Houses, Cottages, Bungalows, Barns, etc. We can furnish the material complete for any of these designs. This book is mailed free to those who correctly fill in the coupon below. Even if you have no immediate intention of building, we advise that you obtain a copy of our **FREE BOOK OF PLANS**. It's a valuable book.

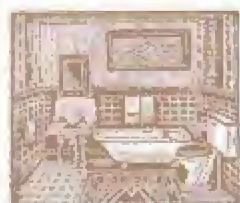
Our Guarantee

This company has a capital stock and surplus of over \$1,000,000.00. Absolute satisfaction guaranteed in every detail. If you buy any material from us not as represented, we will take it back at our freight expense and return your money. We recognize the virtue of a satisfied customer. We will in every instance "Make Good." Thousands of satisfied customers prove this. We refer you to any bank or banker anywhere. Look us up in the Mercantile Agencies. Ask any Express Company. Write to the publisher of this publication. Our responsibility is unquestioned.

\$2.00 Buys a Complete Set of Blue Prints

We send you a set of plans for the house described above, including the necessary specifications and complete list of material, transportation charges prepaid, for the low cost of \$2.00. This is only a deposit, a guarantee of good faith, and the proposition to you is that after receiving these blue prints, specifications and list of material, if you can place an order with us for complete bill of material, we will credit your account in full for the \$2.00 received, or we will allow you to return these plans, specifications, and list of materials to us and we will refund \$1.50, thereby making the total cost to you 50 cents.

High Grade Bathroom Outfits!



The price of this Bathroom Outfit **\$37.50.**

Plumbing material direct to you at Bargain prices.

We have everything needed in Plumbing Material. Our prices mean a saving to you of 30 to 50 per cent. Here is an illustration of a bathroom outfit we are selling at \$37.50. Your plumber would ask you about \$60.00 for this same outfit. It is only one of many other complete outfits that we are offering at prices ranging from \$25.00 to \$50.00.

Write for Our Free Plumbing Material Catalog No. 530.

Hot Air Furnaces!

Don't let the contractor for your hot air furnace until you get our figures.

We will cut your local dealer's price in half. We can furnish you a complete equipment, including pipes, registers, furnace; everything required at a price not much more than what an ordinary heating stove would cost you. Complete hot air heating plants **\$48.00 up.**

Get our heating catalog at once. Tells you all about it. Write us today. We guarantee to save you money. We loan you tools. We make you plans. Every heating plant we sell is backed by our guarantee bond.



Hot Water Heating Plants!

We guarantee to save you **50 to 75 per cent** on a modern hot water heating plant for your home.

We make you complete plans and instructions and help you out every way we possibly can. We loan you tools. Every plant backed by our guarantee bond. We furnish the material; you get the plant installed. **Cut out the local dealer's profit** and cut the cost in half. Thousands of our plants installed and working perfectly in every part of the country. **Write today for our Special Heating Catalog.** Tells all about our heating proposition. We can furnish Heating Apparatus for any building, no matter how large. Tell us your needs. **Write for Free Special Heating Catalog No. 530.**



Water Supply Outfits

Modern Air Pressure Water

Supply Systems at prices ranging from **\$48 to \$200.** They are strictly new, first-class and complete in every detail. Even though you live in the country, you can enjoy every city comfort at little expense. Why not investigate this. We are ready to furnish you with all facts free of charge. All material fully guaranteed. We also have a complete stock of Pipe, Valves and Fittings at 40 to 50 per cent saving.

Gasoline engines at low prices.

Acetylene Lighting Outfits

Write today for our circular describing our modern house and barn lighting outfits; economical, simple and better than any other isolated system; no odor, smoke or soot.

Price for complete outfit for an 8 room house, including Generator, Piping, Tools and necessary Gas Fixtures **\$150.00** Other outfits at proportionate prices. Suitable for homes, stores, hotels or for any place where light is needed.

Send Us This Coupon

Chicago House Wrecking Co.

I saw this ad in Popular Mechanics.

I am interested in.....

NAME.....

TOWN.....

CHICAGO HOUSE WRECKING CO., Thirty-Fifth and Iron Sts., **CHICAGO**

Benefits of Navy Training

HAVE you observed a young man who has been trained in the navy? Noticed how well he carried himself; how sure he was of his ground?

¶ The training he received in the Navy makes a man self-reliant, alert and practical. He is taught to do well and quickly the tasks he sets out to do.

¶ A young man has an opportunity in the navy to learn a trade. As he becomes more useful he is advanced in pay and promoted in rating. The Navy is a **just employer**. If a man behaves himself, he is **certain** to win success. There are numerous ways of rewarding faithful men in addition to promotion—for skill as a gun pointer, for excellence in performance of duty, for good conduct, for continuous service and for extraordinary heroism. Sickness and disability incurred in line of duty are provided for, and retirement after thirty years' service on $\frac{3}{4}$ pay and allowances.

¶ **PARENTS** are asked to consider the many advantages open in the Naval Service for boys over seventeen. Steady employment, practical training, chance for advancement, healthy life and a liberal education acquired by travel. **Only boys of good character are accepted.**

*Send for illustrated booklet which fully
explains life in the Navy. It is FREE.*

ADDRESS

Bureau of Navigation

DESK 69

Navy Department, WASHINGTON, D. C.

This One





Cabinet
Illustrated
K-11-C,
Price \$50.00



Perfect Tools in Perfect Condition

YOU know how easy it is for tools to get misplaced—how quickly they get rusty and lose their sharpness—when you try to keep them in the old time tool box. It is almost impossible, no matter how hard you try. For these reasons you should be particularly interested in

KEEN KUTTER TOOL CABINETS

Every tool, from the smallest gimlet to the largest saw, has a place of its own. When you want a tool you just naturally reach up and get it. They never touch each other, so they can't get dull that way. They don't get rusty for the air-tight doors keep out dirt and moisture. Every tool is the best of its kind—the Keen Kutter trademark is your guarantee. It has stood for highest quality in tools for over 40 years.

Keen Kutter Tool Cabinets are the only tool cabinets made containing a complete set of tools under one trademark and guarantee that means money back if not satisfied.

Keen Kutter Tool Cabinets vary in price from \$8.50 to \$125.00, depending on the number and kinds of tools selected. All cabinets contain such accessories as sand paper, glue, nails, oilstones, etc. Take a look at your size to-day. If not at your dealer's, write us.

"The Recollection of Quality Remains Long After the Price is Forgotten."

Trademark Registered

—E. C. SIMMONS

SIMMONS HARDWARE COMPANY, Inc., St. Louis and New York, U. S. A.

Popular Mechanics Magazine

318 W. Washington Street, Chicago, U. S. A.

EDITED BY H. H. WINDSOR

ISSUED MONTHLY

SUBSCRIPTION:

SINGLE COPY, 15 CENTS

In United States and its possessions, Cuba and Mexico, per year, postpaid	\$1.50
To Canada	1.75
To all other countries in the Postal Union	2.00

All subscriptions are discontinued at expiration. Please examine the date printed on your wrapper.

Entered as Second Class Matter Sept. 15, 1903, at the Postoffice at Chicago, Illinois, under Act of March 3rd, 1879.

Published monthly by POPULAR MECHANICS CO.

Copyrighted 1911, by H. H. WINDSOR.

The attention of prospective advertisers is called to the policy of this magazine in accordance with which the publisher waives all claim for payment of any advertisement appearing in any issue where the number of copies actually printed and circulated is less than the number printed on the front cover page.

Contents for December, 1911

Motor Flywheel Keeps Car Out of Canal.....	771	Ventilating Fans of Great Size.....	813
A Steeplejack's Daring Leap.....	772	Crow's Nest on Wireless-Tower Antennae.....	814
Raising Pigs on the Bottle.....	772	An Australian Stone-Dressing Machine.....	814
Pulp Waste Converted into Wood Alcohol.....	772	Locking Faucet for Tanks.....	814
Wreck of the British Naval Airship.....	773	New Pneumatic-Tube System.....	815
Remarkable Pictures of Fire Rescue.....	774	Fresh Air for Firemen.....	816
Automobile Plow Makes Battle Trenches.....	774	Tarred Roads Destroy Brook Trout.....	816
Non-Capsizable Aeroplane Experiment.....	776	Golf Competition on Shipboard.....	816
Carried Ashore on Tidal Wave.....	776	A Portrait with Every Hat.....	818
New American Aerial Weapons.....	776	Human Organs Radioactive.....	818
Wagon Wheel Used as Mailbox Turntable.....	776	Cincinnati's Roof-Garden Schoolroom.....	818
Denver Through a Clock Face.....	777	For the Handling of Radium.....	819
Cooling Dining Cars of Egyptian Road.....	777	Telephoning Across the Atlantic.....	820
German Baby Carriages Bear Numbers.....	778	By George E. Clarke	
Clever Device for Transporting Motorboat.....	778	A 20,000-Cord Pile of Pulp Wood.....	822
Diamonds Sometimes Explode.....	778	Streets Have Concrete Insets.....	824
Free Municipal Laundry for the Poor.....	779	Electric Shocks for Balky Mule.....	824
Automobile Jumps Forty-Two Feet.....	779	"Lest Ye Forget".....	824
Dutch Colonial House of Handsome Design.....	780	The Blowing Up of the "Liberte".....	826
Streamline Form in Aeroplane Designing.....	781	Burgess Swims English Channel.....	826
By Victor Loughheed		Pedocycle Invented by Californian.....	826
Growing Tree Lifts Millstone.....	786	Washington Monument Attacked by "Geological Tuberculosis".....	829
Tubular Radiator for Automobiles.....	786	By John S. Mosby, Jr.	
High-Speed Alternators.....	786	Alpine Climbing by Railroad.....	830
Testing the Balconies of a Theater.....	787	Novel Miniature Paper-Making Machine.....	831
Radium Building for Paris University.....	787	To Tunnel under Canals of Venice.....	831
Anti-Seasick Chair.....	787	New Type of Tea Strainer.....	832
San Francisco Has Giant Windmill.....	788	The French Dirigibles.....	832
Calcutta Has "Holy Perfume" Hoax.....	788	Great Guns Clip War's Fine Feathers.....	832
The First Telephone.....	788	Chicago Chinese Have Own Telephone Directory.....	834
Wireless from Aeroplane to Motor Car.....	789	Aluminum Fumes Destructive.....	834
The Horse, Like the Buffalo, is Disappearing from the Plains.....	789	An Illuminated Tennis Court.....	834
Thirty Years' Progress in Railroad Trains.....	790	France Has Aero-Repair Motor Truck.....	835
Ingenious Method of Advertisement.....	791	Distilling Metals in a Vacuum.....	835
Sanitary Drinking Pump.....	791	Feather Headdress Six Feet High.....	835
Illuminated Balloons as Air-Way Guides.....	792	Machine for Adzing and Boring Railroad Ties.....	836
Question of Stability in Air.....	792	Non-Explosive Tanks and Cans for Gasoline.....	837
Homemade Motor Mower.....	792	Remembering the Whalemens.....	837
An Automobile Organ.....	793	Soldiers of the Orient Experts in Climbing.....	838
Training the Ostrich to Race.....	793	206,000,000 Tons of Soda in African "Soda Lake".....	838
Gruesome Sixteenth-Century Watch.....	794	Jerusalem in Strange Garb.....	839
British Drill Whet.....	794	Working-Model Locomotive Burns Gasoline.....	840
Rifle Designed to Fire Dirigibles.....	795	Special Transformer for Physicians.....	840
Armored Motorboats for Turkey.....	795	New Big-Gun Arrangement Like Old.....	840
Budapest Bank Has Slot-Machine Depositories.....	796	New Antoinette Arouses Interest.....	842
Knowledge of Ore Mountain Traded for Dog.....	796	Bright Lights Attract the Shoppers.....	842
The Secret Experiments of the Wright Brothers.....	797	Sun's Power Operates Pumping Plant.....	843
Comment and Review.....	805	New Method of Sealing Canal Dikes.....	844
By H. H. Windsor		The Kingdom of Dust.....	846
Impressive Mobilization of America's Naval Power.....	808	By J. Gordon Ogden	
Electric Lighting for Aeroplanes.....	808	Automatic Electric Fireless Cooker.....	850
The Vaniman Transatlantic Dirigible.....	810	Granite Telegraph Poles in Switzerland.....	851
Railroads Guide Airmen by Night as Well as Day.....	811	Rapping Bar Used to Train Jumpers.....	851
Combined Army Tent and Waterproof Cape.....	813	Chronograph Fitted with Fountain Pens.....	852
		Extending Construction Track without Rails.....	852

[Continued on Page 6]

Popular Mechanics offers no premiums; does not join in "clubbing offers," and employs no solicitors to secure subscriptions. It is for sale by nearly every newsdealer in the United States and Canada.

Contents—Continued

Pneumatic-Tube Service to Carry Money.....	853
Combined Telephone and Lamp Standard.....	853
English Suggestion for Disposal of Chauffeur.....	853
Relative Energy of Radium.....	853
Guiding Vessels by Electric Impulses.....	854
Electricity to Destroy the Codling Moth.....	854
French Automatic Ticket-Distributor.....	854
"Tailor-Made" Guns.....	855
Electric Baggage Trolley in Railway Station.....	855
A Loop Nut.....	855
A Spreader for Boiler Tubes.....	856
Disinfection in the XVII and XVIII Centuries.....	856
Crinoline and Automobiles.....	857
Brass Foundry on Battleship.....	857
Raw Food Said to Make White Corpuscles.....	857
Two-Purpose Tungsten Fixture.....	858
Long Flatcar Has Cable Trusses.....	858
Earth's Magnetism Swings Transmission Lines.....	858
The Fusion of Carbon.....	859
New Wall Plug and Spacer.....	859
An Ingenious Roofing Nail.....	859
Gasoline Gun Cleans Auto Machinery.....	859
Elevating Runners for Automobile Repair.....	860
Wearing Qualities of Linoleum.....	860
Artificial Marble from Cinders.....	860
A Key-Filing Jig.....	860
An Answer to the Servant Question—Part II.....	861

By Henry Tarkington

Extra Seat on Auto Top.....	866
Ancient Tunnels of Jerusalem.....	866
How to Make a Tabouret.....	867
Meat Unloader for Provision Ships.....	868
Population of Europe is Denser Than China's.....	868
Parachute Attachment for Monoplanes.....	868
Perspiration-Proof Shoe Lining.....	869
A Simple Flower Stemmer.....	869
Mounted Giraffes in Monster Showcase.....	870
Magnetism Causes Drill Holes to Deviate.....	870
Non-Puncture Tire-Testing Machine.....	870
Making a Good Citizen Out of a Savage.....	871
New Toys Exhibited in Paris.....	872
Spring Wheel for Automobiles.....	873
"Ark" Built by Illinois Religious Fanatic.....	874
French Bottle Covering Prevents Breakage.....	874
Metal Work and Etching—Part III.....	875

By John D. Adams

Australian Blacks Show Burial Cunning.....	877
Sulphur Fertilizer for Potatoes.....	877
Revolving Motor with But Three Cylinders.....	878
Concrete-Steel Iron-Ore Dock.....	878
An Electric Fruit Car.....	878
Clock Sign Announces Church Services.....	879
Fishing Nets Look Like Headdress.....	879
Giant Cactus Resembles a Spur.....	879
French Metallic Filter.....	879
Motion-Picture Houseboat in Holland.....	880
Illuminated Cap Badges for Hotel Runners.....	880
Radium Motors for Clockwork.....	881
Chinese Use Wooden Type.....	881
Stone Wagon Punctures Asphalt Pavement.....	881
Face-Measuring Device for Opticians.....	881
Basket Boats Still Used in Wales.....	882
Superstitions of the Japanese.....	882
Simple Speed Indicator for Ships.....	883
Tool Chest Designed for Use in Army.....	883
New Machine Saws 240,000 Paving Blocks per Day.....	884
Patents Issued by the Confederacy.....	885
No Electric Resistance at Absolute Zero?.....	886
The "Olympic" Accident.....	886
Two New Aeroplanes Designed by Blériot.....	887
Motorboat Jumps from River to Shore.....	888
Quart of Honey Means 48,000 Miles' Flight.....	889
Walking Exercise in Bed.....	889
A Submarine Setting on the Stage.....	890
Dust Deflector for Ends of Trains.....	890

SHOP NOTES

Ash-Can Dust Absorber.....	891
Wheels on a Shop Stepladder.....	891
Substitute for a Small Lifting Magnet.....	892
Protecting Automobile Engines from Intense Cold.....	892
An Air Compressor.....	892
Anchoring a Post to Concrete.....	893
Bright Cutting on Aluminum.....	893

A Nut Arbor.....	893
Adjustable Feed Bags for Horses.....	894
A Belt Stick.....	894
Pulling an Automobile Out of a Rut.....	894
Quickly Made Tool for Bending Pipe.....	894
Stencil Making—Part I, Designs.....	895
Repairing a High-Pressure Hose.....	897
Holding Screws When Repairing Beef Tracks.....	898
Removing Rust Pits in a Rifle Barrel.....	898
Drill Feed for a Lathe.....	898
Automatic Pump Control.....	898
Repairing a Loose-Jointed Chair or Stool.....	899
A Double Nut Lock.....	900
Thawing a Frozen Pipe.....	900
Shaking Up a Telephone.....	900
Water Barrel for a Concrete Mixer.....	901
Bending Heavy Brass Braces.....	901
Aid in Nailing On Long Ceiling Boards.....	901
Coat Hanger on a Chair.....	902
Lathe Dog for Small Work.....	902
Clip to Keep a Pencil from Rolling.....	902
Homemade Canvas Belt.....	902
To Keep a Paint Brush Soft.....	902
Underground Conduit Construction.....	903
Water-Depth Regulator for a Tank.....	905
Taking Care of Leaks Through Hinged Windows.....	906
Holding a Bolt in a Turning Crank.....	906
Detector for Polarity of Electric Wires.....	906
Adjustable-Height Clothesline.....	906
Oiling a Lathe Cup Center.....	907
Grip for Strap Iron.....	907
Pointing Brick Walls.....	907
Marker for Door and Window Head Casing.....	908
Fitting Screws in Old Holes.....	908
Lemon Squeezer.....	908
A Show-Window Stick.....	909
Nail Kegs Used as Bins.....	909
How to Make a Small Jack.....	909
A Spanner Wrench.....	910
Window Lock.....	910
Attaching a Lathe Dog on Threads.....	910
Brush for Cleaning Commutators.....	910
Finishing a Hammer Handle.....	910

AMATEUR MECHANICS

A Model Steam Engine.....	911
Magic Spirit Hand.....	912
Equilibrator for Model Aeroplanes.....	913
Repairing Christmas-Tree Decorations.....	913
Homemade Scroll Saw.....	913
How to Make a Watch Fob.....	914
An Austrian Top.....	914
Pockets for Spools of Thread.....	915
Cleaning Leather on Furniture.....	915
A Baking Pan.....	915
A Broom Holder.....	915
A Darkroom Lantern.....	916
Preventing Vegetables from Burning in a Pot.....	916
A Clothes Rack.....	916
How to Make Corner Pieces for a Blotter Pad.....	917
Boring Holes in Cork.....	917
Pot-Cover Closet.....	918
Aid in Mixing Salad Dressing.....	918
Saving Overexposed Developing Prints.....	918
An Ironing-Board Stand.....	919
A Desk Blotting Pad.....	919
Sleeve Holders for Lavatories.....	919
How to Make a Brass Bookmark.....	920
Cheesebox-Cover Tea Tray.....	920
Piercing-Punch for Brass.....	921
Kitchen Chopping Board.....	921
A Carpenter's Gauge.....	921
A Flatiron Rest.....	921
Use for Paper Bags.....	921

Interesting Patents, Practical or Unique.....	922
Jokes.....	924

The Tesla Turbine.....	925
------------------------	-----

By E. F. Stearns

Italian Hydroplane of Curious Type.....	927
Wireless Calls Heard Across the Pacific.....	928
Theater of Military and Naval Operations of Italy against Turkey.....	928
Bomb-Dropping Device for Aeroplanes.....	930
To Connect the British Empire by Wireless.....	930
Flag of the Chinese Revolutionists.....	930



"No—Thank you! Pummo Soap for Mine."

ONCE tried, PUMMO SOAP is indispensable to mechanics and other workers who need a soap that will remove dirt, grease, grime and stains more thoroughly and quickly than ordinary toilet soaps. PUMMO will make the skin cleaner and whiter than any ordinary soap—in half the time.

PUMMO SOAP is composed of pure vegetable oils, glycerine and finely powdered Italian pumice. While its cleansing action is quick, searching, thorough, it leaves the skin soft, white, refreshed.

If your dealer does not have PUMMO, fill out and mail the coupon underneath and we will gladly send you free sample.

Made by THE N. K. FAIRBANK
COMPANY

Price
5c



Please send me Free Sample Soap

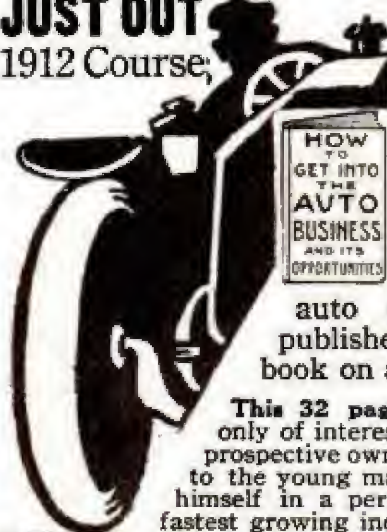
Name _____

Town _____

State _____

Gne. N. K. Fairbank Company, Chicago, Ill.

JUST OUT
1912 Course;



HERE IS A BOOK ON MOTORING

Written by A.L. DYKE, the man who originated the first auto supply business and published the first practical book on automobiles.

This 32 page illustrated book is not only of interest to the auto owner and prospective owner, but of special interest to the young man who wants to establish himself in a permanent, paying and the fastest growing industry in the world today.

TELLS YOU HOW TO GET STARTED WITHOUT CAPITAL

- it will show you how hundreds of others started and will open your eyes as to the possibilities in this field.
- it will tell you all about the present and the future of the great motor industry and the opportunities it offers.
- it tells you about opportunities never before equalled in the history of the world.
- contains 32 pages, fully illustrated and very interesting and instructive.
- it is worth its weight in gold to you—don't miss it.

IT IS FREE. SEND FOR IT NOW

—it will also explain my NEW IDEA system of teaching you by mail—with wonderful, real, actual metal, moving parts, **WORKING MODELS** of parts of the automobile and engine. In addition to the models there are 12 instruction books, with examinations and 175 charts and a Manikin of the automobile. **Positively** the simplest and quickest method to master this profession ever devised.

DYKE'S NEW IDEA SYSTEM

is a Higher Development of Correspondence Methods Retaining the Advantages of Individual Instruction, Progressive Text Books and Written Drills and adding Actual Practice on Working Models—a Necessary and Complete Link Between Theory and Practice.

Actual Practice on Working Models

These Models Actually Work—You can crank the engine, set the valves, time the ignition. On the large model you can see how all the parts go together. There are several models with actual metal moving parts.

The system is endorsed by Oldfield, Duryea, Splitdorf, and other leading authorities.

My system is the only system that can be taught by mail. I teach you the principle and construction of Automobiles and Gasoline engines (engines for Aero and Launch work also) so thoroughly, you can open a repair shop, overhaul cars and engines, drive, sell cars on commission—in fact there are over a dozen branches in this field open and all are explained in this free book.

We are starting others every day, we can do as much for you. My free book will show you how to start and how others made their start, we will show you hundreds of testimonials.

HERE ARE A FEW

"I am driving a 'Winton Six.' I do all my own repair work."—Edw. Sawyer, Montclair, N. J.

"Your Course enabled me to get a good position which has increased my income."—Geo. E. Davelarn, Prosser, Wash.

"I was formerly farming, but am now in the auto repair business."—Geo. Milholke, Rheinbeck, Iowa.

"I have been driving a car now for a month, and I owe it all to your Course."—Ramsey Stewart, Jansen, Utah.

"I am now driving a Packard 30. Your Course helped me wonderfully."—Edw. Hauler, New Orleans, La.

COURSE SENT ON TRIAL

THE COURSE COMPLETE—and all Models and Manikins, Charts, etc., are SENT ON TRIAL for you to see for yourself how easy it is to learn by this "New Idea" system. There is a special offer being made right now whereby you can get Course complete for only \$12.

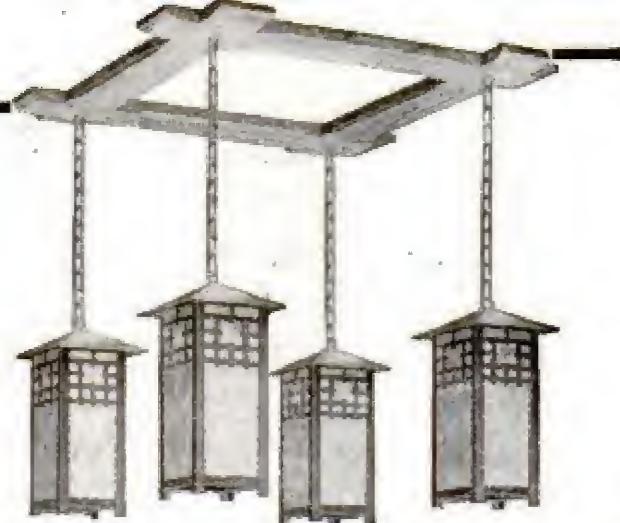
SEND FOR FREE BOOK

This book is absolutely free and does not obligate you whatever.

DYKE'S CORRESPONDENCE SCHOOL OF MOTORING

Box 88, Roe Building, ST. LOUIS, MO.

(Patents Applied for and Pending)



The Importance of Good Light

is a question which is receiving much merited attention these days. Do you know that instead of paying \$10.00 each or more and up for artistic lamps of various designs, you can make your own at an almost negligible expense. We give you the plans and instructions in two books.

Arts-Crafts Lamps HOW TO MAKE THEM

By JOHN D. ADAMS

96 Pages — 50 Illustrations — 5x7 — Cloth
Comprises 16 designs of extensive variety to be constructed from paper, cardboard and wood. One of these designs is illustrated in a lower corner of this advertisement.

Lamps and Shades IN METAL AND ART GLASS

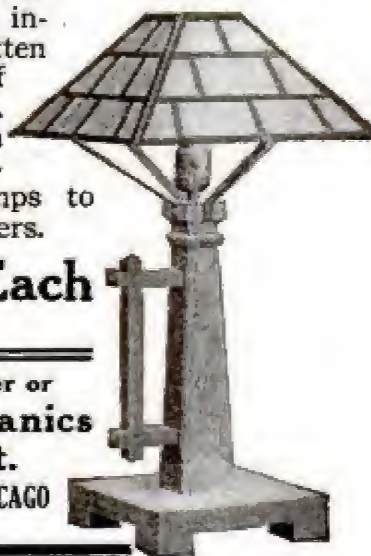
By JOHN D. ADAMS

128 Pages — 64 Illustrations — 5x7 — Cloth
Takes up the making of 18 designs using wood, art-glass and metal. One is shown at the top of the page. This work is not as difficult as would at first be supposed as the instructions are written with the needs of the amateur in view. The designs in each book range from ordinary reading lamps to pretentious chandeliers.

Price, 50c Each
POSTPAID

Order of your dealer or
**Popular Mechanics
Book Dept.**

318 W. Washington St., CHICAGO





POSTAL LIFE BUILDING



35 NASSAU ST. NEW YORK

Strong Postal Points

First: *Old-line, legal reserve insurance*—not fraternal or assessment.

Second: *Standard policy-reserves*—now more than \$10,000,000.

Third: *Standard policy-provisions*, approved by the State Insurance Department.

Fourth: *High medical standards* in the selection of risks.

Fifth: *Standard rates* but reduced by commission dividends, *guaranteed in the policy*, as stated herein.

The **Postal Life Insurance Company**
pays you the commissions that
other Companies pay their agents.

45% of the first year's premium is the average *Commission Dividend* guaranteed to each POSTAL policyholder on entrance into the Company. Other companies would pay this sum to an agent—as *his commission*.

That's for the *first year*; in subsequent years POSTAL policyholders also receive the *Renewal Commissions* other companies pay their agents, namely, $7\frac{1}{2}\%$; likewise they receive an *Office-Expense Saving* of 2%, making up the

Annual Dividend of **$9\frac{1}{2}\%$** Guaranteed in the Policy

And the POSTAL pays the usual contingent dividends *besides*—ranging up to 20% of the annual premium.

Such is the POSTAL way: it is open to you. Call at the Company's offices if convenient or *write now* and find out the exact sum it will pay you at your age—the *first year* and *every other*.

POSTAL LIFE INSURANCE COMPANY

The Only Non-Agency Company in America

35 Nassau St., New York

See How Easy It Is

In writing simply say: *Mail me insurance-particulars for my age as per POPULAR MECHANICS for December.*

In your letter be sure to give:

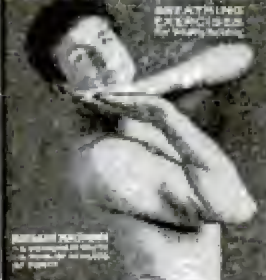
1. *Your Occupation*
2. *The Exact Date of your Birth*

No agent will be sent to visit you: the POSTAL LIFE employs no agents.

Assets:
\$10,839,000

Insurance
in force
more than
\$55,000,000

PHYSICAL CULTURE



Bernarr Macfadden's Physical Culture Course—FREE

in order to quickly secure new subscribers to the
Physical Culture Magazine

we're going to give away a complete course in physical culture, personally prepared by Mr. Macfadden, to every person sending us \$1.00 for an eight months' subscription.

If we were to market this course for profit we could not offer it at a cent less than \$15.00

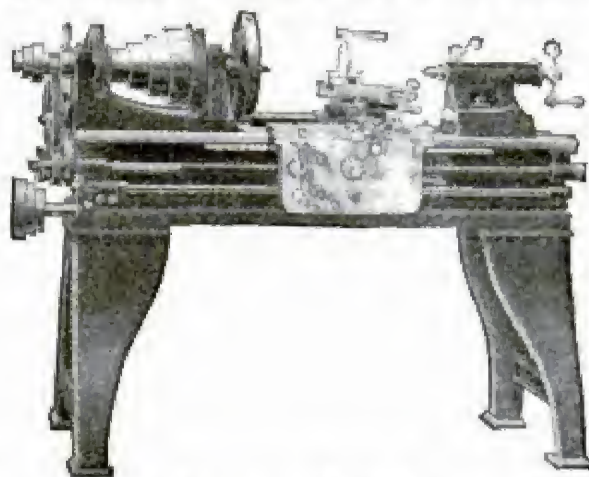
We feel certain you'll become a regular subscriber when you have read PHYSICAL CULTURE for eight months. It's the most needed periodical in the field of literature because it teaches you how to be well. It will save you many dollars in doctor bills if you heed the advice it contains. Not alone the most valuable magazine published but one of the most interesting.

Just enclose \$1.00 and say, "Send me that free course and enter my name for an eight months' subscription to PHYSICAL CULTURE." Your money back any time you're not satisfied.

PHYSICAL CULTURE PUBLISHING CO., 412 Flatiron Bldg., New York

ATTENTION:

**GARAGES, AUTOMOBILE and
GENERAL REPAIR SHOPS**



Are you in the market for a Lathe?

If so, before placing your order elsewhere, be sure and investigate the merits of our **15-inch lathe**, as it is the ideal lathe for your work. The quality is there and the prices are low. We also build 9 and 10-inch foot power lathes. A copy of our catalog will be mailed free on request.

**THE SEBASTIAN LATHE CO., 107 Culvert Street
CINCINNATI, O.**

**Send Us This
Postal**



**and We'll
Send You
This**

**NEW
ILLUSTRATED
CATALOG**

**WHEN YOU WANT ANYTHING AND DON'T
KNOW WHERE TO FIND IT
WRITE BUREAU OF INFORMATION,
POPULAR MECHANICS CHICAGO**

The Best Book For Beginners

**A Practical Course in
By Wm. F. Willard Mechanical Drawing**

Price 50c
Postpaid

**POPULAR MECHANICS BOOK DEPT.
318 W. Washington Street, Chicago**

Three Months—25 Cents

Let us send you a trial subscription to our finely illustrated magazine, **Electrician and Mechanic**. Practical directions for all kinds of electrical and mechanical work. Aviation. Wireless Telegraphy.

Sampson Publishing Co., 514 Page Building, Boston, Mass.

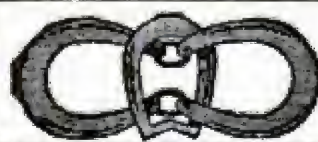
Have You a Camera?

Send us 25 cents for 3 numbers of **American Photography**, full of practical suggestions, formulas and directions for making better pictures. Monthly prizes. Prints criticized. Questions answered. \$1.50 a year. **American Photography, 514 Page Bldg., Boston, Mass.**



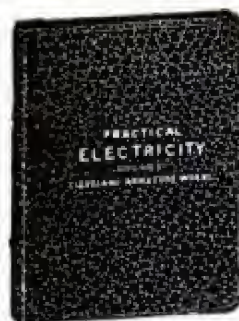
Every Boy His Own Toymaker

Greatest boys' book ever written. Tells how to make a Steam Engine, Telephone, Magic Lantern, Boats, kites, balloons, electrical and mechanical toys, traps, fishing tackle. 200 illustrations; also catalog of 150 puzzles. Set of Keller's Trick Cards and "DOUBLE THROAT" warbler and bird call, all for only 10c. **WESTERN PUZZLE CO., ST. PAUL, MINN.**



127 KINDS Iron, Wood, Wire & Steel PUZZLES

Sample with Catalog 10 cents, or 3 leaders for 25 cents. **WESTERN PUZZLE WORKS
St. Paul, Minn.**



A SCHOOL WITHIN ITSELF

There are XX chapters in all, XIX carrying you from the fundamental principles of electricity on through the various branches to a point where the careful student comprehends the complete designing, care and operation of a dynamo or motor, and one chapter on electric automobiles, outlining their construction, care and operation, and all about storage batteries and how to handle them. Each subject is carefully written and to the point. After a student studies a subject, he is questioned on that subject in such a manner as to bring clearly to his mind the points he needs to know regarding same. The book contains a dictionary defining 1500 Electrical Words, enabling the reader to ascertain the meaning of any electrical word, term or phrase used in this book, as well as hundreds of others in common use. All required tables necessary in the study are in it.

\$2.00 PER COPY—SIXTH EDITION—30,000 COPIES SOLD.

not satisfactory upon examination is AN UNUSUAL ONE in connection with the sale of a book. But we have no fear of its return. Your decision will be what thousands of others have been. Money would not buy it if it could not be duplicated. We could print testimonials by the hundreds. It is best to order and be your own judge of its merits.

CLEVELAND ARMATURE WORKS, Cleveland, Ohio

Armatures and Fields Wound - Commutators Titled
AMERICA'S GREATEST REPAIR WORKS



The Greatest Technical Library in the World

At an original cost of over one million dollars there has been prepared 99 Volumes of the International Library of Technology. This Library contains the knowledge obtained through years of experience by the greatest business, manufacturing, and engineering concerns in the world. The matter has been written by the best technical experts obtainable and illustrated by a special staff of artists and draftsmen. In these books are found the best modern methods of American engineering, shop, field, mine, and laboratory practice. It is the only practical technical library in existence that can be readily understood and practically applied by those having no knowledge of higher mathematics.

Edwin S. Cramp, vice-president of the William Cramp & Sons Ship and Engine Building Company, of Philadelphia, states:

"I have examined the International Library of Technology and have no hesitancy in saying that it is the most complete set of technical books that I have ever had the pleasure of placing in my book case. The thoroughness with which you go into the various subjects is marvelous."

The Library contains over 42,000 pages and 20,000 illustrations; 99 Volumes durably and handsomely bound in three-fourths red morocco, stamped and numbered in gold. The type is large and easy to read and is printed on a high-grade book paper. Each volume is 6 by 9 inches in size. The Library is sold in sets of 5 or more Volumes.

This storehouse of the world's best technical brains awaits to help you advance, to broaden and better yourself. Send us this coupon NOW.

INTERNATIONAL TEXTBOOK COMPANY
872, Scranton, Pa.

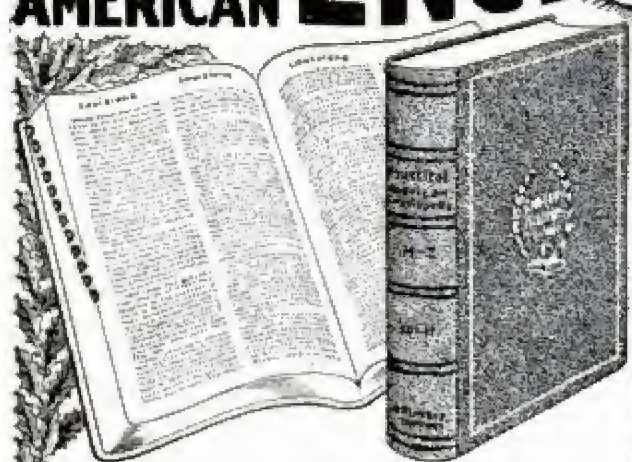
Please send, without further obligation to me, full description and particulars regarding the International Library of Technology.

Name _____

St. and No. _____

City _____ State _____

THE GREATEST PRACTICAL AMERICAN ENCYCLOPEDIA \$3.50



WE have the largest printing and book-binding plant in America. It must be kept busy the year round, whether times are slack or good.

For that reason we have arranged to publish this **greatest encyclopedia of modern times** and sell it at manufacturer's cost. Ten years of tireless research by world prominent educators have made this wonderful encyclopedia so complete that it gives **instant reply** to the thousands of questions arising in our daily experience. Printed in large type—easy to read—on opaque Bible paper, bringing the two volumes into a thickness of 1½ inches. **Contains 2,700 pages, size 8¾ x 6¼.** Bound in flexible cloth, or morocco—flat when open. A condensed rival to the best and most expensive encyclopedia published. Keep them for ready reference at home—at your office—or any place where you are likely to want practical authoritative information right away. No digging through scores of volumes to get the gist of a subject. Whether **Business, Art, Religion, Science, or any one of 8,500 subjects**—you will find it in these two books—

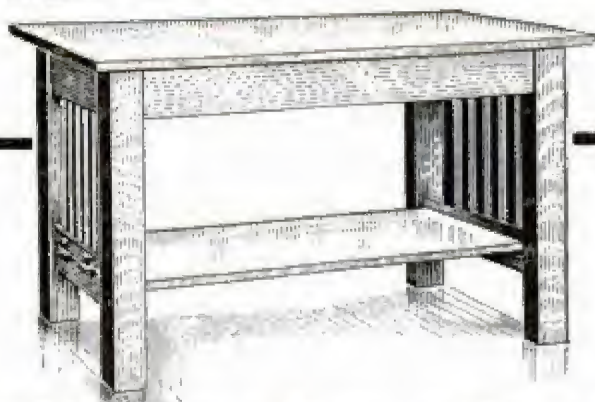
boiled down—brought to a focus—sharpened up so that you can see the point without unnecessary reading. **Completely thumb indexed for instantaneous reference.** The whole range of knowledge is summed up in these two convenient, flexible cover books.

Read This Experimental Offer

Thousands of these sets have been sold at \$6.25 and were well worth it. If we can sell them by the tens of thousands at \$3.50, we will do it to keep our plant busy the year round. This will return us cost of making and give you the benefit of buying without middleman's profit. But the \$3.50 offer is only experimental and the price will go up at once unless large sales come back quickly from this advertisement, so order now—this offer may not appear again.

The Practical American Encyclopedia, 2 vols., flexible cloth bound, gold embossed, \$3.50 prepaid. Same in de luxe edition, bound in genuine American morocco, gold embossed, \$4.00 prepaid. **Packed in holly box—great for Xmas gift if desired.** Money back if not completely satisfied. Be one of the thousands to get in on this experimental price of \$3.50. Send today—by next mail.

W. B. CONKEY CO., Dept. 17, Hammond, Ind., Printers and Bookbinders



Mission Furniture HOW TO MAKE IT 50 Designs for \$1.00

What one man accomplished with the aid of these books:

Popular Mechanics Co., Hattiesburg, Miss.
318 W. Washington St., Chicago.
Sirs: Please send me Part Two, Mission Furniture: How to Make It, by mail postpaid. I have Part One, and have made and sold \$100.00 worth of one piece of furniture, and I am not a carpenter either, but with the instructions "Written so I can understand it," I have a business of my own.
Yours truly,
JOHN S. COLEMAN.

TWO VOLUMES

PART ONE

21 Designs. 96 Pages. Cloth Cover. Price 50c Each, Postpaid.

PART TWO

32 Designs. 128 Pages.

POPULAR MECHANICS BOOK DEPT.
318 W. Washington Street, CHICAGO

WHEN YOU WANT ANYTHING AND DON'T
KNOW WHERE TO FIND IT
WRITE BUREAU OF INFORMATION,
POPULAR MECHANICS CHICAGO

MONTHLY CASH PRIZES

Until further notice in this magazine the Editor of Popular Mechanics will pay two cash prizes each month for the best original contributions to its

SHOP NOTES DEPARTMENT

\$10 for the Best Contribution
\$5 for the Second Best

THIS IS IN ADDITION to our usual rates for such contributed articles.

Quality, not length counts.

Checks will be sent on the last day of each month for the prize articles received during that month. Publication in the magazine will follow in about two months.

PRIZES AWARDED FOR OCTOBER, 1911

First Prize—CHAS. HOMEWOOD, Waterloo, Ia., \$10
"Cork Corners for a Drawing Board"
Second Prize—FRANK ROSENBERG, Worcester, Mass., \$5
"Hanging Pictures"

EXTRA AWARD

On account of there being five contributions this month, each of which deserved second prize, we have made an EXTRA AWARD of four additional second prizes, as follows:

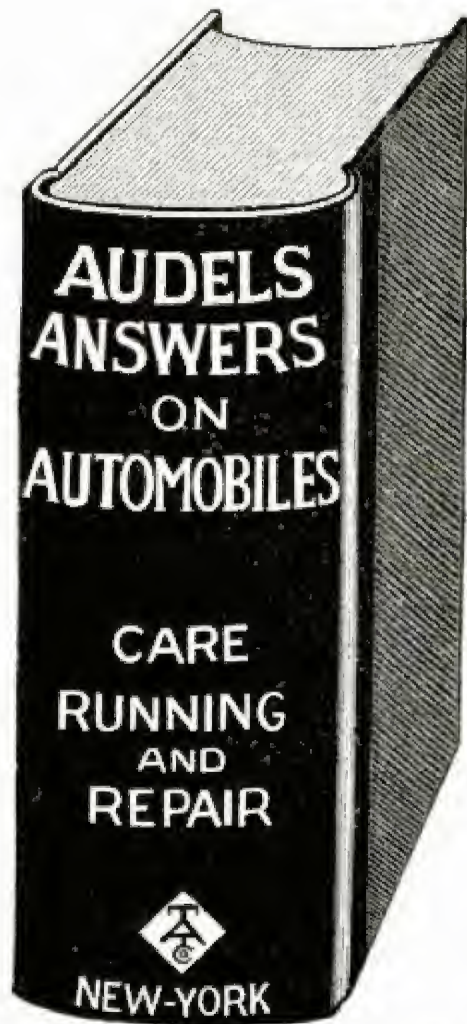
FRED GRINHAM, St. Louis, Mo., \$5
"Removing Carbon Deposits in Gasoline Engines"
F. G. MARBACH, Cleveland, O., \$5
"Wedge for a Hammer Handle"
D. L. KELLOGG, Stillwater, Minn., \$5
"Weatherboard Spacing Gauge"
BERT L. FORSE, Poughkeepsie, N. Y., \$5
"Keeping Dampness from Tools"

All accepted contributions to our departments, "SHOP NOTES" and "AMATEUR MECHANICS," are paid for immediately; checks for prize awards are sent at the end of each month.

Address, **EDITOR POPULAR MECHANICS**
318 W. Washington St., Chicago

A CHRISTMAS BOOK

For Automobile
Owner—Operator—Repairman
or Intending Purchaser



AUDELS ANSWERS ON AUTOMOBILES

WHAT YOU GET OUT OF A CAR DEPENDS MORE ON
THE MAN AT THE WHEEL THAN THE CAR ITSELF

¶ This new book on the practical care and management of Motor Cars, explaining in Questions and Answers the principles of construction and operation in a clear and helpful way, illustrated with 380 diagrams and drawings, making it of great value to the intending purchaser, driver and repairman.

¶ Don't have breakdowns. Keep your machine in perfect adjustment and running order by knowing your car, and that is how "AUDELS ANSWERS ON AUTOMOBILES" can help you.

¶ In this 512 page book the symptoms are diagnosed in such simple language that a beginner can understand the why, and that will enable you to get more service and speed from your machine.

¶ Every rattle—every jar—every noise, is a symptom that you can cure, by knowing.

¶ With this as a guide you will keep your car in running order 365 days a year—each day you can obtain a greater efficiency from it. Highly endorsed by men who know. **Price \$1.50**

A BOOK WORTH HAVING

"Understand Your Car." Explained in the Following Chapters:

1. Ready Reference Index. 2. The Automobile. 3. The Gas Engine. 4. The Cycle of a Gas Engine. 5. Brief Outline of Gas Engine Principles. 6. Cooling Systems. 7. Fuels. 8. Carbureters. 9. Ignition. 10. Timing and Balancing. 11. Gas Engine Operation. 12. Clutches. 13. Transmissions. 14. The Drive. 15. The Differential. 16. The Running Gear. 17. Tires. 18. Brakes. 19. Ball and Roller Bearings. 20. Lubricants and Lubrication. 21. Motor Cycles. 22. Electrics. 23. Electricity. 24. Dynamos and Motors. 25. Storage Batteries. 26. Methods of Circuit Changing. 27. How to Run an Automobile. 28. Overhauling the Car.

NONE OTHER JUST AS GOOD
FREE EXAMINATION

We don't want you to take our word, or anyone else's for it. We are willing to send you the book without deposit. Use it seven days in connection with your car. Then send back the book or remit \$1.50. Could anything be fairer?

Cut out and fill in your name and address plainly at the bottom. Place it in an envelope and mail.

This Book Will Speak for Itself

Theo. Audel & Co., 63 Fifth Ave., New York

Kindly mail me copy of Audels Answers on Automobiles, and, if found satisfactory, I will immediately remit you \$1.50, or return the book to you.

NAME.....

OCCUPATION.....

ADDRESS.....Dec. P. M.

NOTICE—The below reduced size page will be read with great interest:

FIELD FOR DRAFTSMEN

*This Page taken from *Popular Mech.* Advertising Section Jan. 1910*

Big Demand for Mechanical Draftsmen. Positions Paying \$100 to \$150 Per Month

It is perhaps not known to many Readers of Popular Mechanics, but especially to the ambitious, wide awake, and progressive ones and to the large number of Mechanics reading this paper that there is no better field or opportunity for advancement than there is to the practical and well trained Mechanical Draftsman.

But not that man is wanted who has the largest or most expensive library of technical school books "at home," neither the one that carries along with him under his arm when applying for a position a nicely engraved "beautiful Diploma" on paper (costing \$50 to \$75 per sq. ft.) nor the "would be" Draftsman that can "copy" a nice looking picture from another picture with given dimensions.

No, the demand is for Draftsmen with practical Drafting Room training that can "Do Things," Do it "themselves," and Do it right away "Right."

No Employer cares for your Diploma, neither for your set of nice "Books at Home" in your Book-case. He wants you to "Deliver the Goods" for the money he pays. To Draw \$100—\$150 per month, the average Salary paid to Draftsmen, you must be able to do more than "Only make a Copy" of someone else's drawing. Originality and practical ability is demanded of you and this requires practical training.

The quickest and best way to be trained on practical Drafting Room work and to get the required practical experience is to receive personal and individual Instruction from a High

Grade practical man at the trade, with a reputation as the most experienced man in training men to become COMPETENT and SUCCESSFUL DRAFTSMEN.

An ordinary Draftsman, not even the best Draftsman can teach this trade unless he has many years of experience as an Instructor, and has ability to impart knowledge that is understood and that will stick forever. A special gift that 99 out of 100 do not have.

Mr. P. Dobe, Chief Draftsman of the Engineers Equipment Co. (inc.) Chicago, with 20 years experience in training and handling men has for a good many years given personal individual Instruction by mail with the most deserving success, because his Instruction work consists of actual practical Drafting Room work that gives his personal student and apprentice the required practical experience.

He treats each student personally and gives him individual practical working instruction according to the ability of the student to master the work and to advance. His instruction is not given as patent medicine the same for all alike, and his personal assistance is very valuable to anyone.

Mr. Dobe has been an advertiser in this paper for a good many years and will send his "Successful Draftsmanship" Prospectus, 6x9, also list of 250 open Draftsmen positions and full information free. Anyone earnestly interested should write to him personally, his advertisement appears on last page of this book.

Read it over again Every Word true

NOTICE—I accept for Instruction only a limited number of desirable and success-promising students, and not, like schools do, anybody and everybody that can pay the price.

Read my advertisement on last page

Read my advertisement on last page

Classified Advertisements

Advertisements in this section, 10 cents per word, each insertion payable in advance. To insure ads being inserted under proper classified head in the January issue, copy must reach this office not later than December 1st.

Popular Mechanics Magazine,
318 W. Washington St., Chicago, Ill.

Gentlemen: It gives us pleasure to advise that the results received from our classified ads in *Popular Mechanics Magazine* have been very satisfactory. As a matter of fact they have been way beyond expectations. We have used the classified columns of *Popular Mechanics Magazine* for nearly three years. Although we advertise in several hundred other publications we consider *Popular Mechanics Magazine* the leader. We, of course, extend to you the privilege of using this commendatory letter in any way you may consider beneficial to your interests. We beg to remain,

THE AUTOMOBILE AND CYCLE CO. OF AMERICA.
1787 Broadway, New York City.

AUTOMOBILES

REBUILT THOMAS CARS. The Thomas Motor Car Company has for sale a few factory rebuilt cars which carry the same guaranty as new ones. These cars have been all torn down, worn parts replaced, the chassis reassembled, and the body repainted and refinished. Two particularly interesting bargains are a 1910 "Six-Forty" Model M Touring Car for \$2,200, used as a demonstrator, and a 1909 6-passenger 6-cylinder Model L for \$1,000. Other attractive propositions are listed in our descriptive bulletins, giving specific information regarding actual condition of each car. Write us, stating your wants. E. R. Thomas Motor Car Co., Buffalo, N. Y.

A. C. C. A. PRICES TALK! Great opportunity for dealers to stock up! Hundreds of Runabouts, Roadsters, Touring Cars, Limousines Sacrificed! Here's some Bargains, Offered! (50) Runabouts—Reo's, Oldsmobile's, Ford's, Cadillac's, Northern Long Distance \$50—(10) Light five-passenger touring cars—Buick's, Reo's, Cadillac's, Maxwell's, Autocar's, White Steamer's, Rambler's, Jackson's \$100—\$175. (20) three and four passenger Roadsters and speeders—Buick's, Ford's, Stoddard-Dayton's, Thomas', Pierce-Arrow's \$200 upward—(14) five and seven passenger touring cars, many of them leading French and German makes \$500 upward. (21) Limousines, Landaulets and miscellaneous taxi-cabs at your own price. We Guarantee every car! We prepay Freight! Write today for our latest illustrated Catalog, the largest and most complete price list of its kind ever published! The Automobile and Cycle Company of America, Dept. C, 1787-1788 Broadway, New York City.

AUTOMOBILE INSTRUCTIONS, four weeks' course covering shop and road work—provision for out-of-town men. Send for booklet, P. M. West Side Y. M. C. A. Automobile School, 318 West 57th St., New York, N. Y.

AUTOMOBILES FOR SALE—1907 Reo, in fine condition, repainted this summer. 1909 Peerless, 7-passenger, fully equipped, leather top, lined; seat covers, windshield; speedometer and clocks; tire trunk, 4 new tires, 2 used tires and 5 extra tubes. 1911 White Toy Tonneau; good as new. R. W. Moorhead Co., Kittanning, Pa.

FOR SALE—Several unused five passenger White Steam Automobiles at really bargain prices, using gasoline or kerosene for fuel. Write today. Charles O. Pape, Fort Wayne, Ind.

A FEW RARE BARGAINS in roadsters and touring cars taken in trade. Some suitable for light delivery. Overhauled and in best of condition. Box 72, Fenway, Mass.

YOUR CHANCE TO MAKE BIG MONEY in your own town. Sell the right oil for Ford's, Hudson's, Chalmers', and other makes. Steady income. Liberal plan. Write today. Mr. B. C. Day, Consolidated Lubricants Co., 551 West 42nd St., New York.

GREAT BARGAIN in National Electric. Tires and motor good. Write Parrett Machine Co., Waukegan, Ill.

FOR SALE—WHITE STEAMER Touring Car. Five passenger. Fully equipped. Price right. Address Frank Whitten, Blackfoot, Idaho.

AUTOMOBILES. SAVE DEALER'S PROFITS, buy direct from the owners. I have all makes runabouts from \$50 up; touring cars from \$100. Don't purchase any car until you get my prices; all guaranteed for one year. King, Automobile Broker, 213-217 West 125th St., New York City.

STEAM CAR Correspondence School. Particulars, 520 Fourteenth St., Denver, Colo.

WINTON—4 CYL. 30 hp. touring; perfect condition. Tires fine; equipment complete. Everything like new. For quick sale, \$375; cost \$2,600. "Private," 246 Lenox Ave., New York City.

WHITE STEAMER 30 hp. model G, luxurious, seven passenger touring. Elegantly and completely equipped. Cost \$4,700; sell \$400. Suite 457, Thoroughfare Building, 972 Eighth Ave., New York City.

CADILLAC 5 passenger touring car, perfect condition, first \$110 takes it. McDonough, 147 Morningside Ave., New York City.

BUICK 5 PASSENGER touring car, top, full equipment. Excellent condition, \$150. Spillane, 248 East 119th St., New York City.

FORD "1911," FIVE PASSENGER, four cylinder touring car complete and luxuriously equipped; must sacrifice for \$400. Miss Stern, 1 East 131st St., New York City.

FORD—4 CYLINDER—40 horse-power touring; expensively equipped; power plant, tires, paint, upholstery elegant condition. Cost new nearly \$3,000. First offer \$400 accepted. The "Theresa," Suite 18, 117 West 129th St., New York City.

FORD 4 CYLINDER RUNABOUT; elegant condition. Fully equipped; \$125. C. Kokesch, 2537 Belmont Ave., Bronx, New York City.

RUNNING GEAR for Buggy Type Automobile or Light Delivery. James Allen, Jr., Adams, Mass.

FORD 1910—5 passenger touring; full equipment; good as new; must sell at once; \$325. Wilson, 2230 Seventh Ave., New York City.

100 SINGLE CYLINDER RUNABOUTS. Cadillac, Oldsmobiles, Reos, etc., \$80 each. King, 217 West 125th St., New York City.

ONE HUNDRED FIFTY takes 2 Cylinder Motor Delivery. Capacity, 1,000 lb. Bend, Frost, Somerset, New York.

REO 5 PASSENGER touring; perfect in every way; \$175. Room 79, 219 West 125th St., New York City.

WANTED—AUTOMOBILES any make, year or condition; what have you? Room 73, 211 West 125th St., New York City.

FORD—4 CYLINDER RUNABOUT—runs and looks like new. \$150. Shonnard, 114 Fifth Avenue, New York City.

BUICK—5 passenger touring—finely equipped—\$175. Picture—H. W. S., 17 Washington Street, East Orange, N. J.

FORD, BUICK, OVERLAND, E. M. F., Maxwell, Air-Friction Carbureters drive your cars 3 miles per hour on high. Much more speed; much less gas. Starts easy in cold weather. Satisfaction or refund money. Air-Friction Carburetor Co., Dayton, O.

\$325 BUYS METZ RUNABOUT, 1911 model, speedometer, Hartford shock absorbers, fine lamps, generator, tire chains, horn, tools, etc.; ran 500 miles; splendid condition. Chas. H. Oils, Ann Arbor, Mich.

OLDSMOBILE RUNABOUT, \$50; 2½ hp. stationary engine, \$40; Indian motorcycle, \$125. Zoller Bros, Muncie, Ind.

LIST OF AUTOMOBILE, Motor Cycle and Bicycle Bargains for Stamp. Owl Auto & Cycle Exchange, Louisville, Ky.

SEE WHAT WE SAY under "Patent" heading. Swift, Attorney, Washington.

STEAM CAR OWNERS. Myers Kerosene Burner, something new; write for circular, 729 West Colfax Ave., Denver, Colo.

GET OUR LIST of used Automobile Bargains. Box 275, Burlington, Wis.

AUTOMOBILE MODEL. Every part shown and named. You can to all intents and purposes take off the wheels, raise the hood and remove the body; exposing to view the vital parts. The only practical method of studying the automobile. Price 50 cents postpaid. Popular Mechanics Book Dept., Chicago.

"THE HOW AND WHY of the Automobile."—A 200-page book of practical information for seekers after the fundamental facts regarding the gasoline engine and its application to the motor car. Interesting and instructive to both the beginner and the expert. Bound in full cloth—250 illustrations. Price \$1.00 postpaid. Popular Mechanics Book Dept., Chicago.

AUTOMOBILE SUPPLIES

TIRE SPECIALS: Brand new 1912 fresh stock; just bought an entire surplus stock. Order today while they last; 28x3, \$9.25—\$2.50; 30x3, \$9.75—\$2.60; 30x3½, \$13—\$3.50; 32x3½, \$14.50—\$3.95; 34x3, \$22—\$4.75. Other sizes, price in proportion. Write for complete list. We ship C. O. D. subject to examination upon receipt of express charges. Para Auto Tire Co., 7 W. Randolph St., Chicago, Ill.

START AUTOMOBILE TIRE REPAIRING. Cost but a few cents a repair. Every owner ought to have an outfit. Send \$2 for complete Vulco Outfit, enough for fifty guaranteed repairs, with which you can earn \$25. Easy to do, no tools required. Richardson Tire Co., Hartford, Conn.

TIRE BARGAINS! A. C. C. A. prices talk; Diamond-Goodrich's and other standard makes—Guaranteed—Every size for every rim; 28x3, \$6.00; 32x3, \$8; 28x3½, \$9.25; 30x3, \$7.00; 34x3, \$9.00; 28x3½, \$10. All other sizes and tubes proportionately low. Shipped on approval. Write today for price list. The Automobile and Cycle Company of America, Dept. B, 1787 Broadway, New York City.

WE MAKE A BETTER unguaranteed Automobile tire than most guaranteed tires. You get exactly what you pay for. Gums, Fabrics and Mechanical goods. National Company, 1400 Clxhourn Place, Chicago, Ill.

FOR SALE—1" and 1¼" Planhard carburetors, latest type, with auxiliary air adjustments. \$4 for either size if taken at once. Snap. Never used. Address S. E. Brown, 23 Eldredge Court, Chicago, Ill.

AUTO TIRES—GUARANTEED—28x3, \$9.85; tube, \$2.75; 30x3, \$10.50; tube, \$2.85; 30x3½, \$14.95; tube, \$3.75; 32x3½, \$15.75; tube, \$4.25; send for complete list. I ship, allow examination on receipt of 10% amount of order. 1910 customers reordering. Vanderpool, Springfield, Ohio and Jacksonville, Fla.

HAVE SMALL QUANTITY, best make Reeliners. Will sell at cost. Write for prices. Also best make Red Rubber Goggles that sell elsewhere at \$1. Our price, 45c postpaid. Box 726, Trenton, N. J.

AUTOPARTS FOR ALL CARS. We can furnish parts to build, rebuild and remodel all cars. Tell us your needs. Some of our bargains—New mohair tops at \$12.50; 32x3 Morcan & Wright guaranteed are at \$8; tubes at \$1.80. Autoparts Mfg. Co., Detroit, Dept. 12.

LIGHT RUNNING GEAR, \$15; Runabout front axle with wheels, \$8; rear axle, \$10; steering gear, \$8; two rear wheels, \$4.50. Chamberlain, Bartley, N. J.

ENGINE TROUBLE TEXT BOOK. Gives plain language remedies for every engine ailment. Keeps your car running, saves dollars. 56 pages illustrated. Get it now. Send 10c. Breeze Carbureters, Newark, N. J.

FOR SALE—1911 Cyl. Air 30 hp., \$100, and 2 Cyl. water-cooled 20 hp. Auto Engines. 2 Running Gears. \$75 each. Formula: Starts your balky Auto Engine first crank in cold weather. Dime. Otto Schaefer. 922-24th St., Milwaukee, Wis.

INSTANTANEOUS ENGINE STARTER. By the use of the Admiral Primer; one turn of the crank starts your motor, always. \$3.50 prepaid. Correspondence with retailers and jobbers solicited. The Mid-Western Mfg. Co., 806 Forest St., Kansas City, Mo.

BARGAINS in brand new 4 cylinder, 34x44 and 4x5 automobile engines; equipped with magneto. F. E. Alford, Goshen, Ind.

CARBURETOR TROUBLES VANISH with our Gasoline Purifiers. Guaranteed. Free Booklet. Metropolitan Sales Co., 37 Harrison Ave., Detroit, Mich.

TEN THOUSAND 1/4" SAFETY VALVES, one dollar each postpaid. State pressure wanted. J. L. Lucas & Son, Bridgeport, Conn.

FOR SALE—FOUR 32x3 single tube tires, second-hand, A1 condition; \$5 each. One new 34x3 1/2 Pisk bolted on tire, \$12. One new Diamond single tube 28x2 1/2, \$8. One 28x3 new Diamond single tube, \$10. One new 32x3 Hartford clincher, tire and tube, \$12. North Ave. Auto Exchange, 1423 North Ave., Bridgeport, Conn.

FOR SALE—AUTOMOBILE RUNNING GEAR complete with springs, Differential gear, Sprocket, brake wheel, steering gear; A1 condition. Price \$15. North Ave. Auto Exchange, 1423 North Ave., Bridgeport, Conn.

FOR SALE—15 HP. White Steamer engine and generator, complete outfit, \$80. One 10 hp. Cadillac engine with transmission and coil, \$40. One Offset Boiler and burner, 16 inch, \$40. R. Roth, 1423 North Ave., Bridgeport, Conn.

FOR SALE CHEAP: New Wishart vulcanizing kettle; 5 hp. Kewanee boiler; Westinghouse Electric Vehicle motor; Cleveland sliding gear transmission; 1,200 feet seamless 1 1/2 in. 22 gauge steel tubing; Remy Magneto; Western Electric 4 cylinder new vibrating coil; New Ajax 6-60 storage batteries; Pair new auto wheels and axles, with equalizing gear. All of above dirt cheap to close out. Graham Auto Co., 1518 Madison St., Chicago.

STEAM AUTO BOILERS Bought, Sold and Repaired. J. L. Lucas, No. 2 Fox St., Bridgeport, Conn.

SOMETHING NEW—"Auto heel rest" Aluminum. 75 cents postpaid. Lucas & Son, Bridgeport, Conn.

MOTORCYCLES

MOTORCYCLE CASES AND TUBES—28x2, corrugated, \$5. Bailey, \$5.50; tube, \$2.40; 28x2 1/4, corrugated, \$5.75. Bailey, \$6.25; tube, \$2.65; 28x2 1/2, corrugated, \$6.25. Bailey, \$7. Nobby, \$7.75; tube, \$2.66. Single or double clinch. Guaranteed cases and tubes; Bailey type, single clinch, 28x2 1/4, \$7.75; tube, \$2.65; 28x3 1/2, \$8.30; tube, \$2.82. Price of tubes is by mail, including postage. Send postoffice order for tubes and 25% on cases and 1 ship, allow examination. Wm. Vanderpool, Springfield, Ohio and Jacksonville, Fla.

MOTORCYCLE TIRE BARGAINS! A. C. C. A. prices talk! Diamond-Goodrich, G. & J., and other standard makes—Guaranteed—Gridiron, Basket and Bailey Treads; 28x2, \$4.95; 28x2 1/4, \$5.70; 28x2 1/2, \$6.20; 26x2 1/4, \$5.45; 26x2 1/2, \$6.20. Guaranteed. Tubes priced proportionately low. Shipped on approval. Don't buy until you receive our price list! The Automobile and Cycle Company of America, Dept. A, 1769 to 1787 Broadway, New York City.

FOR SALE—1909—2 1/2 hp. Thein Motorcycle; overhauled; good condition. Band brake, new belt and etc.; tires good; repair kit and tools. \$85. Mauritz Thor, Hasty, Minn.

MAKE BIG MONEY—STEADY INCOME. Sell right Motorcycle and Automobile Oils direct to owners in your town. They save and you make money. Mr. C. D. Ely, Consolidated Lubricants Company, 551 West 42nd St., New York.

MOTORCYCLES WANTED—Will take your motorcycle on consignment and sell it in the World's Greatest Motorcycle Market, New York City, for 5% commission. Write for full particulars. King Automobile Broker, 217 West 125th St., New York City.

CONSTRUCTION, MANAGEMENT AND CARE OF MOTORCYCLES, fourth Edition by E. W. Keller; 104 pages; practical information for every rider or beginner. Complete on all subjects. Postpaid for 25c silver or stamps. T. T. S. & Motor Co., 356 Cedar Street, St. Paul, Minn.

WILL EXCHANGE—Densmore typewriter, Eastman Kodak, and Bristol Fishing Outfit, for good motorcycle. Write for detailed information. D. H. Box 65, Conyers, Ga.

MOTORCYCLE REPAIRING—Let the A. C. C. A. overhaul your motorcycle now and deliver it in Spring—Lowest Prices! Best facilities! Work Guaranteed! Why not ship it today by freight. Automobile and Cycle Company of America, 1769-1787 Broadway, New York City.

MOTORCYCLES—A. C. C. A. PRICES TALK! Endless variety—Latest models—Every make—Indian's, M-M's, \$20. Freight prepaid. Largest and only Illustrated Catalog published, sent free. The Automobile and Cycle Company of America, Dept. A, 1769-1787 Broadway, New York City.

MUST SACRIFICE brand new 4-11 Wagner. A. A. Richardson, Bemidji, Minn.

FOR SALE 1911 RED INDIAN, 7 hp., A1 condition, engine perfect, enamel looks bright and new, in fact, only run a few miles; tires excellent, never punctured. Sacrifice for cash at once. Satisfaction guaranteed. H. C. Wing, Greenfield, Mass.

FOR SALE 2 1/2 HP. MOTORCYCLE engine; good condition, without timer; \$19. F. G. Marcum, 232 Chestnut St., Hamilton, Ohio.

MOTORCYCLES, LOWEST PRICES, largest stock. Save dealer's profits. Buy direct from the owners. I have all makes. Indians, \$20 up; Marshes, \$20 up. Don't purchase any Motorcycle until you get my prices. All guaranteed for one year. King, 213-217 West 125th St., New York City.

FOR SALE—1909 MOTORCYCLE, any make, year, condition. We buy for cash! Let us make a cash offer for your motorcycle! A. C. C. A., 1769 Broadway, New York City.

FOR SALE—Motorcycle, R. S. 2 1/2 hp.; good condition; \$50. Thos. L. Williams, Morganfield, Ky.

GOOD HARLEY, 4, with clutch; \$115. Willard Warstler, Goshen, Ind.

NEW 1911 MAGNETO Harley-Davidson Motorcycle, \$190. P. Wills, Canal Dover, Ohio.

WANTED—MOTORCYCLE: any make, year, or condition; must be cheap. Spillane, 211 West 125th St., New York City.

FOR SALE—Single Curtiss. First class. Box 305, Flemingsburg, Ky.

FOR SALE—1911, 5, Indian. Ralph Leffler, Tiffin, Ohio.

ONLY THREE SECOND-HAND MOTORCYCLES LEFT, 1909 M. M., \$90; 1908 twin Thor, \$140; 1910 Indian, \$150. Conditions guaranteed. Write me. Anderson's Motorcycle Store, Batavia, Ill.

FOR SALE—RED INDIAN motorcycle, 1911 model, 7 hp., run 700 miles, and in excellent condition; \$200. Glen Smith, St. Joseph, Mo. Care Brown Transfer Co.

MOTORCYCLES, \$50 UP. Indians, Royals, Thors, Harley Davidsons, Excelsors, Wagners, etc.; every one guaranteed; send for bargain list and large motorcycle supply catalogue, repairs, etc. F. B. Widmayer Co., 2312 Broadway, New York City.

LATEST MODEL, INDIAN No. 7, Standard Speedometer. Used 1,500 miles. Practically new. Wm. Leffler, Tiffin, O.

DOUBLE CYLINDER CURTISS MOTOR with all equipment for railroad speeder; good condition; \$45. Webster, 604 Brown Ave., Jeffersonville, Indiana.

MOTORCYCLES, ALL MAKES, \$25 up. We exchange everything. Send for list. H. W. Shockey & Co., 1019 South 16th St., Lincoln, Neb.

DETROIT—1911—\$140. Comley, 1714 Rosewood, Louisville, Ky.

ROTARY BICYCLE SIRENS, \$2; motorcycle sizes, \$5 and \$6. Chain repair tools, \$1. Battery or magneto cut-out switches, 75c. Magneto covers, 75c. Coaster brake bicycles, \$25 up. Send for catalogue. F. Widmayer, 2312 Broadway, New York City.

WANTED—USED AUTOMOBILES, Motor Cycles and Bicycles. Owl Auto & Cycle Exchange, Louisville, Ky.

MOTORCYCLES CHEAP—50 secondhand motorcycles that must be sold to make room for new Shaw Motorcycles. Send for special bargain list. Shaw Manufacturing Company, Dept. 30, Galesburg, Kansas.

DON'T BUY A BICYCLE Motor Attachment until you get our catalog and prices. Shaw Mfg. Co., Dept. 27, Galesburg, Kansas.

PIERCE FOUR-CYLINDER MOTORCYCLES scarcely used and in first-class condition; for sale at very low prices. Wm. B. Colburn, 18 Hanover St., Buffalo, N. Y.

SUPPLIES—The largest stock in America. Immediate shipment. Lowest prices. A hundred new ideas shown in our big free catalogue P. Motorcycle Equipment Co., Hammondsport, N. Y.

AERONAUTICS

MANN MONOPLANE holds all world records; distance 2,635 feet, duration 82 seconds. Every model flown 1/4 mile before delivered. Sole agents for U. S. A. A. Melcombe, G. P. O., Seattle, Wash. Accessories list, 2c.

\$25 PURCHASE OUR 20-FOOT Biplane Glider. Completely assembled and guaranteed to carry 185 pounds in safety. Shipped anywhere for \$25 f. o. b. Chicago. Address Glider Department. We carry a complete line of models and supplies. Stamp for catalogue. Aeroduster Construction Company, 3751 Indiana Ave., Chicago.

FOR SALE—FOUR cylinder, 30 hp. Kirkham aeroplane motor; perfect condition; guarantee 240 lb. thrust. A bargain. Send for photos and price. Chas. B. Kirkham, Savona, N. Y.

FOR SALE—MONOPLANE, DEMOISELLE TYPE, twin expanding pitch propellers, transmission and Bleriot alighting gear. Complete except motor \$400. Has flown. Emil F. Komm, Vancouver, Wash.

LEARN TO FLY AT LOUISVILLE this winter. Three monoplanes; three biplanes and one hydroplane for students' use. Many other advantages. Write for booklet of terms. Enclose red stamp. Under supervision of Rubel Co., Louisville, Ky.

LEARN TO FLY in the only successful independent Aero school in the Country. Students turned out last year are making good. Send for descriptive circular. Benoist School of Aviation, University City, St. Louis, Mo.

GRAY EAGLE MOTORS have made good. Twenty-seven aviators are using them flying monoplanes and biplanes. Cost \$485 complete. Write for real facts and illustrated circular. Rubel Co., Louisville, Ky.

HOW TO BUILD an English Racing Monoplane; fully illustrated. Postpaid, 25c. A. Melcombe, G. P. O., Seattle, Wash.

60 HP. AERONAUTIC MOTOR for sale; weight, 180 lbs; best condition. Address G. Whitehead, R. F. D. 2, Bridgeport, Conn.

ALL KINDS OF AERONAUTICAL SUPPLIES carried in stock for standard monoplanes and biplanes. Immediate deliveries. Large illustrated catalogue, eight cents in stamps. Rubel Co., Louisville, Ky.

WORKING DRAWINGS AND DESCRIPTION of Santos-Dumont's monoplane or Wright's biplane. Fifteen cents each, both for twenty-five. Hiblme, 708 W. Lafayette, Baltimore, Maryland.

EXPANDING PITCH PROPELLERS are used by experienced aviators throughout America. Write for interesting illustrated booklet. Enclose red stamp. Rubel Co., Louisville, Ky.

AVIATION PANTS. New French Novelty Up-to-Date, Rich, Racy, "Nuff Said." Sample 25c. Streets Novelty Co., Dept. A, Box 296, Grenada, Miss.

RACERS—Record, 735 feet—50 cents. Catalogue for stamp. Grand Rapids Aeronautic Supply Co., Grand Rapids, Mich.

MODEL AEROPLANE TURBINE, $\frac{1}{2}$ hp., \$2. Co-Operative Aero Association., Muncie, Indiana.

LOOKING FROM AN AIRSHIP. Genuine photograph. 10c. Box 102, Norwich, N. Y.

USED AEROPLANES AND MOTORS reasonable prices. List for stamp. Hubel Co., Louisville, Ky.

COMPLETE PLAN drawn to scale with full instructions for building the only Wright 3 ft. Biplane Model that positively flies. 25c postpaid. Drawing and directions for three-foot model Bleriot Monoplane, 15c. Stamp brings most complete, interesting and instructive catalog published. Ideal Aeroplane & Supply Co., 88 W. Broadway, New York, N. Y.

B. & W. 25 HP. MONOPLANES, \$850 complete; one used machine at \$450. Photos on request. Burgess-Wiseman Mfg. Co., Cleveland, O.

BENTON'S CHICAGO AERO WORKS, 164 North Wabash Ave. Aeroplanes, accessories, wheels, motors, also models, wood, rubber, propellers. Stamp for catalogue.

ARTIFICIAL WHALEBONE, best material for models; automatic stability models, \$5. Kasmar Bros., 1952 North Ave., Chicago.

GENUINE GLENN CURTISS aeroplane four cylinder motor; complete or separate; bargain. Geo. Russell, 1870 Broadway, New York.

HOW TO CARVE PROPELLERS. Complete illustrated treatise, 10 cents. Ideal Aeroplane & Supply Co., 88 W. Broadway, New York.

FIRST LESSONS IN AERONAUTICS. A popular technical book on Aviation. Send to Aero Society, 1952 North Ave., Chicago.

AVIATION MARVEL, Helicopter, metal; self-operative, 25c. J. Press, Norwalk, Conn.

THE AMERICAN SCHOOL OF AVIATION, 1952 North Ave., Chicago.

\$4 BUYS 5 FOOT FLYING MODEL ANTOINETTE monoplane. Complete in every particular. Wheels, triple motors, 12" propeller, reinforced wings. Positively best flying model ever offered at any price. Express paid. Aerodyer Company, Medford, Mass.

LET US SUPPLY your wants. Everything for aircraft. 6 stamps for large illustrated catalogue. Heath Aerial Vehicle Co., 3403 Southport, Chicago.

HOW HIGH? HOW FAR? Why guess at the distance? Obtain it accurately with a Metroscope Case; sent on receipt of \$1. The Metroscope Mfg. Co., 723 W. Mulberry St., Springfield, Ohio.

MODEL AEROPLANES, two-foot Bleriot, Antoinettes, 65c prepaid. Geo. Nero, Bottineau, N. Dak.

SEE WHAT WE SAY under "Patent" heading. Swift, Attorney, Washington.

"VEHICLES OF THE AIR", the newest and only up-to-date contribution to the literature of aeronautics, contains large working plans of all successful modern flying machines. This book of 500 pages, 140 half-tone photographs and 130 drawings is the only book published containing every known fact of this interesting subject. Size, 9x5 $\frac{1}{2}$ inches. Price \$2.50 net, postage 25 cents extra. Popular Mechanics Book Dept., Chicago.

MODEL AEROPLANES HOW TO MAKE AND FLY THEM. By W. Twining. Consisting of 5 sheets of scaled drawings, showing three different models, with descriptive booklet. By mail 55c. Popular Mechanics Book Dept., Chicago.

PATENTS SECURED on Aeronautical Inventions. C. L. Parker, ex-examiner Patent Office, 910 G. St., Washington, D. C.

BOOKS AND PERIODICALS

THE PROGRESSIVE MACHINIST'S MANUAL. Vest pocket ready reference of most needed Rules and Tables, also valuable General and Economic information. List of representative shops throughout the Country. 16 Colored Maps. Blank Memoranda, etc. 120 pages, size 5x2 $\frac{1}{2}$. Leather finished covers. Price 35c. Circular on request. Wm. Cuthbertson, 30 Springside Ave., Pittsfield, Mass.

MECHANICALISM. From Known Mechanical and Biological data, we can determine the true purpose of Animal Life, and clearly define the Nature of that inaccessible Realm of future existence, which has been considered beyond the reach of human investigation. This is clearly set forth in the treatise. The Doctrine of Mechanicism, \$1. S. Scholfield, 95 Westminster St., Providence, R. I.

FOX AND HOUND—Monthly Magazine about Fox, Wolf, Coon, Possum, Mink and Rabbit Hounds; has Beagle Department; \$1 year. Sample free. Fox and Hound, Desk P. Decatur, Ill.

3,000 RECIPES, FORMULAS, and trade secrets. 368 pages, 25c. Electrical Dictionary, 4,000 definitions, indexed, 25c. Modern sign painting, brush lettering, 2,000 advertising phrases, 140 pages, \$1. Books for skilled tradesmen and experimenters; catalog free. Scientific Book Shop, Syracuse, N. Y.

FREE CHRISTMAS PRESENT. A \$2 fountain pen free to new subscribers of "The Globe" (monthly magazine), one year all for 75c. Address The Globe, P. M., 227, Maple, Reno, Nev.

DON'T BUY THAT BOOK! We Loan By Mail the very best standard books on Success, Business, Recreation, Health, Home, Social and Political Problems, Religion, New Thought, etc. Prompt service. No security or tiresome rules. Full lists and Bi-weekly Critic on request. Oriental Esoteric Library, 119, Washington, D. C.

10,000 PRACTICAL AND MONEY MAKING RECEIPTS are contained in Henley's 20th Century Receipt Book, price \$3.00. Special circular on application. Henley Pub. Co., 132 Nassau Street, New York.

BUILD YOURSELF A BOAT. A Racing Cat or Speed Launch. Send for catalogue. Yacht and Boatbuilding Books. Rudder Publishing Co., 3 Hudson St., New York, N. Y.

STEEL TEMPERING BOOK for Mechanics and Digest one year, 25c. Digest, Grand Rapids, Mich.

FREE PRACTICAL BOOK CATALOGUE, including latest popular books for Machinists, Electricians, etc.; sent free on request. Henley Publishing Co., 132 Nassau Street, New York.

EXCELLENT XMAS GIFT! "Little Book of Friendship!" Cloth bound, picture panel covers, 35c postpaid. Frank Dax, 1506 Erie St., Chicago, Ill.

NEW BOOK, money-making opportunities. Circular. Arthur Beers, Bradley Beach, N. J.

BOOKS—Any kind published. Catalogues free. Reese Publishing Co., Mount Pleasant, Pa.

TELEPHONE TROUBLES AND HOW TO Find Them, and Construction Cost-Units, new 1911 edition; price, 25c. Hyde & Co., Telephone Bldg., 183 Fifth St., Milwaukee, Wis.

ENGINEERS' questions and answers for license, by Hobson, for twenty-five cents, postpaid. Send stamps. Reilly's Book Store, Philadelphia, Pa.

GAS FOR POWER is taking the place of steam for reasons of economy. Learn all about this great change by reading our new non-technical book on this subject, written by a first class authority for the practical man. 192 pages, profusely illustrated, cloth binding. Price \$1.00 postpaid. Popular Mechanics Book Dept., Chicago.

"METAL SPINNING" is the name of the only book published on this interesting art. A concise working manual both for those who desire to spin metal as an art recreation and to follow this work as a trade. 80 pages. 33 illustrations. Price, 50 cents postpaid. Popular Mechanics Book Dept., Chicago.

EDUCATIONAL AND INSTRUCTION

SHORTHAND IN 7 LESSONS. Most rapid readable system. Usually learned in 6 weeks. Complete course in 3 books, \$1.25. Send 25c now, and \$1.00 in 5 days or return two books. Unigraph Co., Omaha, Nebr.

MECHANICAL DRAWING, THE WARNER SYSTEM, makes expert draftsmen; if you are earning less than \$25 per week, we can increase your salary; send for particulars. Address The Warner System, Chase Block, Kalamazoo, Mich.

LEARN BOOKKEEPING AT HOME for \$1. Its simplicity shown by practical set of books and business forms. For every entry full and clear explanations. No long study, no high tuition. Price \$1. postpaid by G. Melville, P. O. Box 531, Syracuse, N. Y.

FREE TUITION BY MAIL: Civil Service, Drawing, Engineering, Electric Wiring, Agricultural, Poultry, Normal, Academic, Book-keeping, Shorthand Courses. Matriculation \$5. Tuition free to first applicants. Apply to Carnegie College, Rogers, Ohio.

BE A BOOKKEEPER—Farrar's 20th Century Simplified Book-keeping may be learned in a week. Fastest and most accurate system of accounts. Reduces work two-thirds. Write for Prospectus. Edwin T. Farrar & Co., Portland Bldg., Chicago.

EARN 5 DOLLARS A DAY coloring Photographs and prints. Pleasant home work. Regular or spare time. Write today for free booklets giving full particulars. The National Arts Company, 1223 State Street, Alpena, Mich.

CHINA PAINTERS—EIGHT LESSONS BY MAIL and three complete studies on how to draw easily the violet, pansy, and forget me not, \$1. Henderson, 3222 W. Madison St., Chicago, Ill.

PARAGON SHORTHAND. Learned in one week. Valuable invention by expert stenographer—Not by mere theorist. Writers in Government employ. Speed capacity beyond reach of the hand. Paragon Shorthand Institute, 1432 Camp St., New Orleans, La.

WORKING DRAWINGS OF RECTIFIER, for changing alternating current to direct, for electroplating and experimenting. Easily constructed. Postpaid 25 cents. Central Engineering Co., Belleville, Ill.

LEARN JAPANESE PORTRAIT PAINTING; inexpensive; talent unnecessary. Particulars 4c. Hughes Co., Box 1567, Los Angeles, Cal.

ISOMETRIC PERSPECTIVE. Special \$10 introductory offer. Western School of Drafting, 356 Market St., San Francisco.

STUDY MATHEMATICS, bookkeeping at home, 10 cents in stamps brings first lesson, W., 508 Gough St., San Francisco, Calif.

WANTED IN BANKS—Honest young men. Splendid opportunities. Be a Banker. We can teach you at home. Send for catalogue. American School of Banking, 119 McElene Bldg., Columbus, Ohio.

AMERICA'S FINEST PENMAN teaches rapid, tireless business writing by mail. Small cost. Illustrated Journal free. Francis B. Courtney, Cedar Rapids, Iowa.

SHORTHAND Simplified by mail, \$5. Walter Forbes (Cambridge B), Boston.

LINOTYPE INSTRUCTION: write for Booklet "P." Empire School, 419 First Ave., New York.

TELEPHONE PRACTICE. Complete instruction by mail; qualifies men for quick advancement to high position. Write for particulars. The Sinclair School of Telephony, Cambridgeport, Mass.

YOU CAN WRITE 100 WORDS a minute without knowing Shorthand. My new method, Abbreviated Longhand, simpler than the simplest shorthand, tried and approved by thousands. Your money back if not delighted. Sample lesson 20c. Full particulars free. Write today. A. B. Weaver, Court Reporter, Dept. C, Buffalo, N. Y.

\$200 TO \$800 MONTHLY easily made fitting eyeglasses. Short, easy mail course. Diploma. Special reduced tuition fee. Big demand for opticians. Best and easiest money-making business. Quick sales. Tremendous profits. We assist you to start. Write today for free "Booklet 4." Tells how. National Optical College, St. Louis, Mo.

ELECTROPLATING. Learn this useful occupation from our 112-page treatise. It is "written so you can understand it" and will enable the humblest beginner to make a start. Price, 50c postpaid. Popular Mechanics Book Dept., Chicago.

20. HANDSOME EMBOSSED POST CARDS with your name in Gold in our new style, 15c; 25 high grade Xmas, and New Years Post Cards, 15c. A fine present free with your first order. Bayles, Dept. P, 1408 Third Ave., Brooklyn, N. Y.

STAGE BEAUTY POSES, 4 for 25c, 18-page catalog of 800 illustrations of these and other "den" pictures 50c. 32 illustrations for 2-cent stamp. Gordon Art Co., Dept. A2, New York City.

THE MOST POWERFUL LIGHTHOUSE in the world. Heligoland, Germany. Postals of this and many other lights, home and foreign, on sale by us. Also cards of Irish scenery. Killarney, Glants Causeway, etc. Our catalog sent to any address in world for four cents; or send 25 cents and we will send you catalog and ten of our cards. Lighthouse Mission, Dept. P. M., 21 Linenhall St., Belfast, Ireland.

25 SPECIALLY SELECTED high grade Christmas and New Years post cards in attractive box, postpaid 14c. Agents wanted. Big Profits, Secor Co., 502 West 122 Street, New York.

BARGAIN POST CARDS, \$1 thousand, including Christmas, large variety. Order and be convinced. Publishers Clearing House, 35 South Dearborn, Chicago.

CHRISTMAS CARDS with your name beautifully written, one dozen 15c, (worth 25c). H. Weiss, Dept. M, 9 W. 117 St., New York City.

10 CHRISTMAS POST-CARDS Free with Membership, 10c. Maple Valley Card Ex., Box 1183, Pittsfield, Mass.

YOU'LL GET CARDS FROM EVERYWHERE. Membership, 10c. Idaho Card Exchange, Dept. K, Box 906, Boise, Idaho.

FREE—Beautiful Dancing Girl. Moving picture cards, for distributing 50 circulars; send stamp. Ferguson Microscope Co., Springfield, Missouri.

RECEIVE POST-CARDS FROM EVERYWHERE. Membership, 25 cts. a year. Gem Post Card Club, Dept. B, 428 Bank St., Newark, N. J.

24 EMBOSSED CHRISTMAS CARDS—Tags, name printed, gold, green—20c. Samples, stamp. Agents Wanted. Sharra, 62 Lawn, Pittsburgh, Pa.

RECEIVE CARDS from everywhere. Membership 2 years, 10c. L. G. Strachan, Allston, Mass.

25 ASSORTED SOUVENIR POST CARDS, 15c postpaid. Diamond Post Card House, 2119 Point St., Chicago, Ill.

FIFTEEN LOVELY CHRISTMAS CARDS, 10c. Easy premium plan free. Alvin Card Co., Connellsville, Pa.

100 ASSORTED POST CARDS, 75 cents. Charles Baehr, 1817 E. Passyunk Ave., Phila., Pa.

JOIN HUB POST CARD EXCHANGE. 3 months, 10c. Ross Charles, Roxbury, Mass.

20 COMIC POST CARDS, New Doodles, 10c. Dept. C, Lester G. Strachan, Allston, Mass.

SEND 2c STAMP FOR FIVE SAMPLES OF our very choicest Gold-Embossed Christmas and New Year Flower and Good Luck Post cards; beautiful colors and loveliest designs. Special prices to agents. Art Post Card Club, 614 Jackson St., Topeka, Kans.

PICTORIAL POST CARDS. Picturesque America, consisting of fifty magnificent views of the most noted subjects and places in the United States; lithographed in colors. 11 for 10c. C. L. Myers & Son, 1958 52nd St., Brooklyn, N. Y.

FREE MEMBERSHIP, December-January. California Postal Exchange, 806 Holloway, San Francisco.

YELLOWSTONE NATIONAL PARK VIEWS. The wonderland of America. Instructive scenes. Send 10c silver. Stuart Murphy, 1409 Helena Ave., Helena, Mont.

CUSTER BATTLEFIELD SOUVENIR Views, 10c silver, Stuart Murphy, 1409 Helena Ave., Helena, Mont.

THE LATEST PICTURE HITS, "My Champagne Girl" and "La Belle Danseuse." The two sent complete with 100 other "Catchy" Art Ideas for only 25c. Union Art Co., 585 Garfield Ave., Jersey City, N. J.

JOIN NOW—The members of the Travellers Post Card Club, get cards from everywhere. Membership list, 10c. Travellers Post Card Club, 3508 Carroll Ave., Chicago, Ill.

50 POST CARDS showing trip around the world, 42c postpaid. Econo Co., Box 321, Charlotte, N. C.

22 BEAUTIFUL CHRISTMAS POST CARDS, 10c. Claude Y. Ross, Zanesville, Ohio.

FORMULA—MECHANICS PASTE SOAP for your name. Reply 2c stamp. Johnson Co., 275—12th St., Brooklyn, N. Y.

EXCHANGE POST-CARDS; Correspondence; Books; Magazines; Cameras; Curios; Photographs. Household and Sporting articles, or anything. Membership, 15 cents. National Exchange, 203 East 57th St., New York.

WORLD EXCHANGE LIST and beautiful name card for a dime. World Club, 2100 N. Tremont St., Kansas City, Kansas.

IF YOU REALLY WANT to exchange post cards, try our splendid club. Lists circulate in many countries. Membership, 10c. Halcyon Club, Box 133, Erie, Pa.

CAMERAS, PHOTO SUPPLIES, ETC.

ENLARGEMENTS FROM PLATE AND FILM NEGATIVES. pictures and photographs of the best quality made on all kinds of Bromide. Developing and printing out papers, at the most reasonable prices. General finishing a specialty. Write for price list and catalog of Cameras and Supplies to T. Harold Knight, Dept. C, Racine, Wis.

COLOR PHOTOGRAPHY—Amateurs—Print your landscape views in colors. No paints, brush or special apparatus required. Send 2c stamp for particulars. Process Supply Company, 8A, Campbell Street, Newark, N. J.

FOLDING DARKROOM AND PRINTING MACHINE COMBINED; just the thing for travelling Photographers. Price, \$15. John Delegrad, Nekosca, Wis.

8x10 PHOTOGRAPHY. 25c each, made from any size negative or film. All size 6 exposure Kodak films developed, 5c roll, 12 exposures, 10c roll. Send for price list and sample print, Scarlett Studio, 47 13th St., Philadelphia, Pa.

CAMERA HOSPITAL. We repair all kinds of photographic apparatus, 10 years experience. All work guaranteed, and done in one to three days. Prices reasonable. Lawrence Butler, 219 So. Dearborn St., Chicago.

EASTMANS PHOTO. POST CARDS, made from your kodak films, 100 cards from single negative \$1.50 cash with order. Send film and receive sample card free. Caulkin's Photo Works, Oneonta, N. Y.

ENLARGEMENTS—16x20 from any good photo, 65c prepaid. Rich tone, artistic style, Rembrandt, Greenwich, O.

VOIGTLANDER Collinear Lens, 11x14. Used but a short time. Perfect condition. W. E. McChristie, Cincinnati, Ohio.

GOING TO BUY A CAMERA? Postal brings catalog and full information. L. J. Peabody, 273 Devonshire St., Boston.

AMATEUR FINISHING. Stamp for samples. Can save you dollars. Rembrandt Gallery, Greenwich, O.

FILMS DEVELOPED, 10c per roll. All sizes. Prints: 2 1/4x3 1/4, 3c; 2 1/4x4 1/4, 3 1/2x3 1/2, 3 1/4x4 1/4, 4c; 3 1/4x5 1/4 and 4x5, 5c. On post cards, 5c. Prompt returns. Highest grade work. Send 2 negatives and will print free as sample. G. R. Hoke, 6206 Jefferson Ave., Chicago.

KODAK FILMS DEVELOPED, 10c per roll, any size. Prompt attention given mail orders. Prints 2 1/4x3 1/4 to 3 1/4x4 1/4, 3c; 4x5 to 3 1/4x5 1/4, 4c. J. M. Manning, 1062 Third Ave., New York City.

TRADE SCHOOLS

CHAUFFEUR SCHOOL, \$25 MAKES YOU an expert chauffeur. We teach both driving and repairing. We give driving instruction every day. No lectures. Practical experience is what counts. Address Woodlawn Chauffeur School, 857 E. 63d St., Chicago.

AUTOMOBILE SCHOOL. You learn with your hands under the superintendence of the best instructors obtainable at the Chicago School of Motoring. Write for particulars. F. E. Edwards, Inst., Dept. "B," 1619 Michigan Ave., Chicago, Ill.

ELECTRICITY, PLUMBING, BRICKLAYING, PAINTING and Decorating and Mechanical Drafting, taught quickly by expert workmen. Actual work takes place of books. Tools and materials furnished Free. Splendid positions always open. Oldest, largest and best equipped trade school. Write for catalog. Coyne National Trade Schools, 85 E. Illinois St., Chicago.

DIAMONDS, WATCHES AND JEWELRY

\$2.00 FOUNTAIN PEN, 30c—Most sensational bargain ever offered. Sent postpaid in handsome box with glass filler. Splendid Christmas or New Years present. Morse Bros., 6308 Justine St., Chicago.

SEVEN-IN-ONE—New novelty in jewelry. Scarf pin each day of week. Seven imported stones. Match any color tie. Agents wanted. Great Holiday Novelty. Investigate. Weeks, 3344, Boston, Mass.

HALF OFF ON WATCHES and silverware. Let us show you how to make the dealers 50 per cent discount either by buying for yourself or selling to others. Write for watch book; it's free. E. B. Bonnell & Co., Harrison County, Tippecanoe, Ohio.

DUPLICATORS AND DUPLICATING DEVICES

MULTIGRAPH GOOD AS NEW. \$8 worth of extra type; all equipment. The Multigraph Co.'s adv'g explains the value and usefulness of this machine. Going out of business, will sell for \$100 only. Cox & Beck, Yonkers, N. Y.

How to get a Hektograph that will make 150 copies in 10 minutes; letter size, \$2.00. Write for circular. Hoyer Duplicator Co., 118 No. La Salle St., Chicago.

BUSINESS OPPORTUNITIES

MAKE MORE MONEY! Start Mail Business; operate "Silent Salesman" system; spare time; possibilities unlimited. Get away from wage slavery! "Booster" starts you in business for yourself with small investment; will put you next to the best money making propositions in the world. Send 10c for two months' trial. Booster Magazine, 360 Northwestern Bldg., Chicago.

PATENTED ARTICLE READY FOR MANUFACTURE. Including tools, jigs, dies, drawings, with stock of finished and unfinished parts. An assured sale of product at good profit. Offered at bargain. Write C. S. Briggs, 76 Washington Ave., Detroit, Mich.

INCREASE YOUR INCOME during spare hours. We furnish everything needed, direct from factory, for a Permanent Mail Order Business. Useful, patented pocket specialties; hand-somely nickeled, for leaders. New seasonable novelties. No canvassing; small capital; personal assistance. Large profits assured. Write for our Booklet—plans—references. Handy Mfg. Co., Wacareooms, Brooklyn, N. Y.

BE YOUR OWN BOSS. Start Mail Order Business at home; devote whole or spare time. We tell you how, very good profits. Everything furnished. No catalog outfit proposition; no canvassing. For "starter" and free particulars, address, B. D. Krueger Co., 164 Washington St., Chicago, Ill.

START A MAIL ORDER BUSINESS of your own. Be your own boss. I made \$25,000 in two years with small capital to start. My booklet "Money Making Opportunities in the Mail Order Business," sent free. Address, McKean, Dept. 375A, 2232 Elgin Ave., New York.

WE START YOU IN BUSINESS, furnishing everything; positively \$30 to \$200 weekly operating our celebrated "New System Specialty Candy Factories" home anywhere. Opportunity lifetime, men and women; booklet free. W. Ragsdale Co., East Orange, N. J.

COLLECT MONEY. By a sure, simple, system. Income \$1,000 to \$5,000 a year. Quick results. No capital required. Instructive booklet, "Skillful Collecting," free. National Collectors Ass'n, Long Street, Newark, Ohio.

FARM PUMP ENGINE AGENTS! Steady income and big money selling the right Oil for these Motors. Write today. Liberal plan. Mr. A. B. See, Consolidated Lubricants Co., 351 West 2nd St., New York.

FOR SALE—Iron and Wire Works. Doing an average monthly business of over \$2,000. Business well established. Address G. Schlatter, 714 Palmwood Ave., Toledo, O.

EARN \$30 WEEKLY taking Orders for Cut Rate Groceries or American Largest Grocery House. Outfit Free. Standard Grocery Co., 352 Arcade, Cleveland, O.

BIG PROFITS: Open a dyeing and cleaning establishment, splendid field, very little capital needed. We teach a successful method by mail. Write for booklet, The-Ben-Vonde System, Dept. C, Charlotte, N. C.

CHEMICAL ANALYSES, ASSAYS, MICROSCOPICAL TESTS. Investigations and advice in all chemical questions. 22 years experience. Parobek Chemical Laboratory, Trenton, N. J.

MAKE \$4 daily replating table cutlery; no capital; simple instruction; particulars free. Silver Plating Co., Preston, Ont., Canada, Box 33.

FREE YOURSELF FROM WAGE DRUDGERY! Write postal today for 12 Valuable Dollar Getting Trade Secrets; start a profitable business of your own and become independent. "Be. Money Back Store," Baltimore.

IF YOU ARE LOOKING FOR THE DOLLARS you owe it to yourself to send for our free Booklet. Bliss Bros., 56 Caspar St., Rochester, N. Y.

PUEBLO TURKISH BATHS. Splendid opportunity for man and wife. Cause for selling other interests. For terms address, 23 W. 3rd St., Pueblo, Colo.

BE A MANUFACTURER; Mixer Advocate tells anyone how. Copy free. Lem & Co., Shattuck, Okla.

MAKE BIG MONEY operating a Daydark Post Card Machine. Photo postal cards made and delivered on the spot in ten minutes in the open street. No dark room necessary—it does not require an experienced photographer to make first-class pictures. Pays a gross profit of 500%. Write today for free samples and catalogue. Daydark Specialty Co., Dept. 3-K, St. Louis, Mo.

\$300 WILL PUT IN STAPLE, big-paying manufacturing business. Factory complete, no experiment, no risk; sure, legitimate, unlimited sale. Every merchant, manufacturer, permanent customers. Write Unity Manufacturing Co., Los Angeles, Cal.

A BARGAIN. New patented household article. Sells for \$2. Big profits. Machinery and stock worth \$1,800. Will sell for 1,000. An opportunity. Investigate. G. Shurr, Racine, Wis.

I MADE \$18,000 in three years in mail-order business; free booklet, tells how. H. System, Marion, Ky.

START HOME BUSINESS. Sell your ideas, plans, formulas and knowledge by mail. Some make \$1,000 monthly. Instructive booklet for stamp. Information System, 259, Marietta, Ohio.

I HAVE 5 DANDY NEW ARTICLES to manufacture at home. All big profit payers. Particulars free. P. Benson, Stewartville, Minn.

ENCYCLOPEDIA BUSINESS OPPORTUNITIES (3 volumes). Price \$3; yours for \$1. Booklet free. Clark, 428 Bank St., Newark, N. J.

LOOK! BUSINESS OF YOUR OWN. Particulars free. Ypsilanti News Co., Ypsilanti, Mich., Box 96.

WANTED—If you want to earn from \$20 to \$35 weekly, write us for full information. Address Brown's Correspondence School of Shorthand, Realty Building, Charlotte, N. C.

ELECTRICAL, LOCKSMITHING, BICYCLE BUSINESS for sale. 16 years fine established trade; good location; low rent; well advertised. All for \$2,000. Electrical and locksmithing, 750, McDougald, 1118 N. Clark St., Chicago, Ill.

ENCYCLOPEDIA BUSINESS OPPORTUNITIES. (3 volumes) containing 2,715 rare formulas; 365 new schemes, etc. Price, \$3; yours for \$1. Descriptive booklet free. B. P. Newnam, Saukagean, Ill.

DON'T STAY A POOR MAN. Conduct Self Supporting Business in privacy of your home. Nothing to buy. No canvassing. Paper, pen, ink bring dollars by mail. Full plan, \$1; particulars, stamp. Essex Association, Box 2240 Glenridge, N. J.

DON'T MAKE THE DIRT FLY. Use the Garrett dustless just cloth and absorb the dirt. You can make money making them at home. Big profits and no special machinery. Formula and practical instructions, 25c. Garrett Mfg. Co., Norwalk, Conn.

BE A HANDCUFF KING: make big money on the stage; all auditorium circuits pay from \$50 per week up. I teach everything in this line. For particulars address, Box 902, Springfield Mass.

DON'T SLAVE. Learn to re-silver mirrors, new method. Mettize flowers, transfer photos to watch dials. 10c each, three or 25c, no stamps. The Mills Co., Box 744, Dallas, Texas.

E. R. HOLMES—CONSULTING MECHANICAL ENGINEER; patent solicitor; Capital negotiated for clients, without delay. Best and most perfect service. Send drawings or sketches. Unimpeachable, confidential, reliable, 206 McPhee Building, Denver, Colorado.

LEARN THE ART of silvering mirrors at home, complete instructions, 25c. Haydn Clark, 2019 N. Carlisle, Philadelphia.

I MADE \$18,000 in three years in the Mail Order Business. began small. Send for free booklet—tells how. No "outfit" home. H. System, Marion, Kentucky.

I MADE \$50,000 in five years with a small mail order business; began with \$5. Send for free booklet. Tells how. Heacock, Lockport, N. Y.

MAIL ORDER BUSINESS. You want a good one, buy my 3 day Drink Cure; will demonstrate it and prove its merits. Address Dr. John Soldot, Hamilton, Ohio.

FREE—SEND FOR MY CIRCULARS THAT will put you on the right road to success. Free. Frank Cote, Saco, Maine.

FOUNDRY and Machine Shop for sale, in Texas. Address R. C. 6th floor, 318 W. Washington St., Chicago.

READ OUR ADVERTISEMENT under agents wanted. Pinless Clothes Line Co.

MONEY MADE during Leisure Hours with my Dollar Getting Secrets. Valuable sample free! G. Edward Harrison, Baltimore.

INDEPENDENCE and fortune quickly attained in the Manufacturing Mail-Order Business. I furnish Formulas, Manufacturing Processes and Trade Secrets in all lines. Sold under positive guarantee; 18 years practical experience. Revision and improvement of Formulas and Processes—reduction of manufacturing cost—utilization of waste materials, etc., a specialty Booklet, Formula List, and Valuable Information Free. W. L. Cummings, Ph. D., 127 Standard St., Syracuse, N. Y.

SHORT CUTS, monthly describes the one way by which thousands are making their escape from the "treadmill" and "payday." Wage earners especially interested. Worth \$5 per copy. Tired men, Schemers, those wishing easier money or honest side issue invited urgently. Two months' trial, 10 cents., Burdick, Dept. T, Oshtemo, Mich.

PLANT WHITE ALMOND MUSHROOM SPAWN for early fall crop. Now is the time, plant this new spawn; produces big crop white mushrooms all summer. Four other varieties winter planting; modern plan forcing plants, mushrooms, early quick crop. Book free. Fresh sample brick, 35c postpaid. We are originators and manufacturers of pure tissue culture mushroom spawn. Order direct from laboratory, Challenge Farm, 6961 Gravelly Ave., St. Louis, Mo.

ESTABLISHED GARAGE FOR SALE; largest in Yonkers; regularly storing 50 to 60 cars; two-story building with accommodations for over 100 cars; large repair shop with first class machine equipment. For particulars, address Garage, 217 Riverdale Avenue, Yonkers, New York.

CONDUCT A "CANDY KITCHEN." Clear \$20 daily. Small capital required. Send for particulars. Kennon and Co., 149 West Ontario St., Dept. A, Chicago.

LEARN THE TRUTH about Mail Order Business before buying "outfits." Important information and particulars sent free. Mail Order Library, P. M., Tompkinsville, New York.

MAIL ORDER MEN: Get quick cash returns. We furnish best sellers; factory prices; best plans; positively no "scheme." Prospectus Free. Box M—235 Pittsburg, Kansas.

PATENTABLE IDEAS WANTED—Send for 3 free books. Richard B. Owen, 30 Owen Bldg., Washington, D. C.

\$1 CAPITAL STARTS a good paying mail order business, strictly legitimate. Particulars free. R. Peebles, 11 Forsyth St., Detroit, Mich.

HOUSTON, TEXAS, the railroad, cotton, lumber, rice and oil center of the South, offers unequalled advantages to manufacturers. Houston will encourage and support a Wagon Factory, Gin Machinery Factory, Tool Handle Factory, Furniture Factory, Coopersage Plant, etc. Houston is the supply depot for the great Gulf Coast country. For better advantages, come to Houston. Write for specific information. Address, Chamber of Commerce, Houston, Texas.

MAKE MIRRORS AT HOME. Big profits with little outlay. One 18x26-in. mirror costs \$2 to \$5. You can silver a glass this size for 20c. Send \$1 in stamps or money order and we will send you explicit directions how to do it; also how to emboss, grind, foil, gold leaf, frost, chip and make imitation stained glass. How to transfer photos on glass, bore holes in glass and cut skylights. George L. Patterson & Co., Dept. 3, Brooksville, Ky.

SEE WHAT WE SAY under "Patent" heading. Swift, Attorney, Washington.

I WILL START YOU earning \$4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operation. G. F. Redmond, Dept. 306, Boston, Mass.

BUILD A BUSINESS of your own and escape salaried drudgery for life. Learn the Collection Business. Limitless field; little competition. Few opportunities so profitable. Send for "Pointers" today. American Collection Service, 101 State St., Detroit, Mich.

HAVE YOU ANYTHING TO ADVERTISE? Our Rate Book tells you all about advertising mediums, rates, circulation, closing dates, etc. Sent for 10c. Worth dollars. Folder free. Correspondence invited. Dearborn Advertising Agency, 455 Franklin Bldg., Chicago.

WE START YOU in a Permanent Business with us and furnish everything. We have new easy selling plans and seasonable leaders in the mail order line to keep factories busy. No canvassing. Small capital. Large profits. Spare time only required. Personal assistance. Write today for plans, positive proof and sworn statements. J. M. Pease Mfg. Company, 181 Pease Bldg., Michigan St., Buffalo, N. Y.

BE INDEPENDENT. Start Money Making Mail Order Business at Home. New plans. Everything furnished. Only small capital required. Free booklet and particulars tell how. W. P. Miller Co., Box 254, Muskegon, Mich.

PATENTS SECURED—C. L. Parker, ex-examiner Patent Office, 910 G St., Washington, D. C.

FORM A CORPORATION—Congress Law for D. C. and all States; cheap. Raise money easily; advice free. U. S. Legal Corporation, Washington, D. C. Representing \$1,225,000,000.

AGENTS WANTED

NEW SUIT OFFER! Just send us your name and you will promptly receive the most astonishing—yes, wonderful suit offer, together with Paragon Complete Outfit, packed with big assortment of Cloth Samples, Tape Measure, Fashion Figures, Order Blanks, etc.—all absolutely Free by Return Mail. Postpaid. This includes an offer on a fine suit for yourself so liberal it will satisfy you, and our Grand Offer to start you in a big money-making business for yourself. Our wide-open terms, conditions and privileges will astonish you. The low prices we will make you on men's high-class clothes will amaze you. And we pay all express charges. We go to the limit in liberality. We want you for our agent in your town, so that we can turn all our business over to you. We will start you in a big, established, money-making business. New agents make \$40 a week. Do you wonder that our agents make all kinds of money? We must have an agent in your town. Get our Grand Offer and the Special Paragon Outfit, which is already packed with big Assortment of Cloth Samples and complete equipment, ready to be sent you free, charges paid by us. "First Come, First Served." Rush your answer to us quick if you want a suit for yourself, before some one else gets the prize. Address Dept. 11, Paragon Tailoring Co., Chicago, Ill.

ORDER THIS NOW. I have a Christmas Novelty and present that is going to be the best seller of the season. As the City of Detroit is large enough for me to work, I have decided to sell a few manufacturing rights. Costs less than one cent to manufacture and thousands can be sold at 10c. But you can profitably sell for 5c. No expensive plant or tools required, materials very cheap and are easily obtained. Can be sold by Agents, Streetmen, Boys, Girls and Stores. If you wish something novel, get this. Every person you see is a possible customer for this Novelty. Complete instructions and full working details given and full rights to manufacture for only 50c. Cheap at \$50, considering value of information furnished. I guarantee complete satisfaction and will return your money if the proposition is not legitimate and exactly as advertised. Will you send me your order now, subject to these conditions? D. O. C. Kersten, Detroit, Mich.

GUARANTEED VACUUM CLEANER ABSOLUTELY FREE to every person who will sell to your neighbors only 30 one-pound cans of our Catawba Cream Baking Powder @ 50c a can. We give free with each can a beautiful imported Japanese Air Fern in a genuine spun brass hanging basket. This hanging basket is 4 inches in diameter and is suspended by 3 chains 6 inches long. These hanging baskets are the newest fad and enable an agent to sell the powder on sight. We prepay all the express and freight thus making it possible for every one to own one of the most wonderful labor-saving inventions of modern times, a vacuum cleaner, without costing you one cent. This offer is made only to introduce our Baking Powder and is for a limited time only. Write at once, Buckeye Specialty Company, Desk A, Bradner, Ohio.

SALESMEN—YOUNG MEN who want to act as general agents, managers and open up an office or rent desk room in their own town; they can make \$1,200 to \$7,000 a year; our clever income plan shows them how to do it with our winning fountain pen; we do not want salary grabbers, but men who can put up \$100 to \$500, and then earn money easier and faster than by any other position they have ever tried. You will have your own staff of agents; this means continued sales without hard work. Address Diamond Point Pen Co., 86-88 Fulton St., New York City.

EXCLUSIVE TERRITORY NOW BEING ALLOTTED for Little Giant Lift and Force Pump. Only thing of its kind. It has free field wherever there's plumbing. Removes all stoppages in pipes, saves plumbers' bills, prevents noxious gases. Everyone wants it, everyone can afford it, everyone can operate it. As strong in business world as among homes. Selling at top speed, 50,000 already in use. I can grant you absolute monopoly and fix you for life, if you are the right man. Address at once, J. E. Kennedy, Dept. P, 41 Park Row, New York City.

AGENTS LOCAL, COUNTY AND STATE, both men and women wanted everywhere to sell the Pinless Clothes Line, a practical labor saving invention, lasts a life-time, sells on sight, gives perfect satisfaction, no pins, no trouble, every house-wife wants one, agent Sutton of Georgia has sold over One Million feet 100% profit, write quick for exclusive territory, full information free, sample prepaid 25c stamps, write today. Pinless Clothes Line Co., 540 Lumber Exchange Bldg., Portland, Oregon.

MANAGERS WANTED FOR MAIL ORDER BUSINESS; new high class protected article; easily handled, business can be started in spare time; low advertising cost; will send contract, copies of advertisements, full instructions, and sample of the article complete for 50 cents. Article costs you 5 cents, sells for 50 cents; gives big value. Modern Sales Co., Dept. D, Kiltuck Station, Pittsburgh, Pa.

AGENTS AND SIGN PAINTERS. Steady income, pleasant work, easy hours, your own boss selling Embossed Metallic Window Letters, ready prepared to be put up with Benzine and a roller. Experience only increases speed. Can be put up for less money than any kind of hand painting. Average cost under 2c. Sell up to 35c. Profit always good. Demand enormous. Complete outfit and guarantee cards free. Money back if dissatisfied. Embossed Letter Co., 2612 Milwaukee Ave., Chicago.

AGENTS—To sell the newest electric appliance on the market; sold wherever there is electricity, in the home and office; liberal profit; sales driving sample, weighs a pound, no experience or knowledge of electricity required; it shows how to use one light instead of two and get the same results; sells for \$3.50 and saves the purchaser an investment of \$25; write for particulars, The Handy Light Co., 211 Opera Place, Cincinnati, Ohio.

AGENTS—\$50 a week sure. Beautiful Scenery, Art, Religious, Home and the celebrated largest selling Negro Pictures complete in handsome Papier Mache Frames ready to hang on wall only 12c, sell for 50c to \$1. Many agents sell 100 in two days. Profits, \$40. You can do as well, 300 subjects. Everybody buys 2 or 3. Tremendous sellers. Peoples Portrait Co., Dept. O, 710 W. Madison St., Chicago, Ill.

WANT A FINE TAILOR MADE SUIT? Show our sample to three of your friends, take two orders easy and make profit enough to get a swell stunning tailored suit free. No trouble simply show our new up-to-date samples. Everybody surprised prices so low, styles so beautiful, orders come easy. We take all the risk and guarantee perfect fit or no sale. We pay the express, \$5 a day our new agents are making and wearing the swellest clothes besides; old agents after one season make twice as much. Banner agents have a snap. We want a few more hustling agents, willing to dress swell and make \$5.00 a day and up. No money or experience needed. Write quick before we fill your territory and we will send you free a complete outfit to start at once—beautiful samples, latest styles, colors, everything you need to take orders, all fully explained. We will make you even one beautiful suit at a special insubstantial wholesale price as a sample. It's a wonderful opportunity, write at once or tell some friend who would be happy to get this grand easy money-making chance. Banner Tailoring Co., Dept. 264, Chicago, Illinois.

AGENTS—EVERYBODY HAS TO USE BRUSHES. We want men in every locality to handle our line. We give exclusive rights, 150 per cent profit. We have men who have built up permanent and big paying business with our brushes. Send for catalogue and terms. Torrington Brush Works, Torrington, Conn.

AGENTS CAN MAKE \$10 or more every day selling the Easypump Governor to farmers; will make 5,000 hand and windmill pumps in your county run easier; nothing like it; sells itself; low price; 100% for you. Write now for free territory. Address Chicago Pump Co. & M. Co., Dept. B, 354 S. Wabash Ave., Chicago.

KEY CHECK AND FOB OUTFITS. All the tools for stamping names on key checks and watch fobs. We furnish blank checks, fobs with straps, key rings, etc. Sample key check with your name and address and key ring 15c. Agents wanted to take orders. \$5 per day—That is what you can do with our outfit. A 15-year-old boy can stamp these checks with our outfit. Price free. Pease, Die Maker, Winchester, N. H.

AGENTS—It will cost me about \$2 to secure your name and ship sample machine, but it's a dead sure way of convincing you I've got best household invention on earth. Branch office being established. Opportunity for canvassers and crew managers to make up to \$20 a day. Elmer E. Stevens, 1189 Curtiss St., Downers Grove, Ill.

AGENTS TO SELL NECESSARY ARTICLE in every home where stoves are used. Patented detachable appliances hold the stovepipe in perfect position, prevents the pipe from falling or slipping, danger of fire and suffocation from gas. Article has merit, sells at sight, price reasonable, large profits. Write for secure exclusive territory. National Stovepipe Holder Co., Ottaw Ohio.

AGENTS 100% PROFIT. New Patented Automatic Razor Strapper; automatically puts a perfect edge on any razor, of any style or safety. Retail at \$2. Big seller. Every man wants one. Write quickly for terms, prices and territory. P. Brandt Cutlery Co., 84 West Broadway, New York City.

LIVE AGENTS WANTED—HUSTLERS to handle our attractive 1912 combination packages of soap and toilet articles with valuable premiums. One Michigan agent made \$65 in 47 hrs. another \$21 in 8 hrs.; another \$22.50 in 10 hrs. Write today. Davis Soap Works, 264 Davis Bldg., 1429 Carroll Ave., Chicago.

GENERAL AGENTS WANTED EVERY COUNTY, introducing new invention Flat Iron, heats independent of oils, charcoal, gas, gasoline, alcohol, electricity. Fuel costs 5 cents a day, dust. Solicitors making \$10.00 daily; retails \$5. Samples agents, \$2. Manufacturer, 506 Keystone Bank, Pittsburg, Pa.

AGENTS, AND MAIL ORDER SPECIALTIES that sell 100 to 500% profits. No chance proposition. Success absolutely certain. Three samples for dime. Free particulars. Poulson Manufacturing Company, 213 East Tenth Street, N. Y.

PORTRAIT AGENTS—Crayon, Pastel and Sepia portraits Frames, Sheet pictures, etc. Good work. Prompt shipment. Catalogue and samples free. Hyde Art Co., X, 4535 N. Ashland, Chicago.

SELLING OUR EXCLUSIVE "Linen Heel and Toe" Guaranteed Hosiery direct from mill to wearer, pays big profits. Customers waiting. Re-orders insure increasing income. Exclusive territory. Credit. Sample pair free to test. Address, M. Park Hosiery Company, 726 Chestnut St., Phila., Pa.

EARN \$30 WEEKLY taking Orders for Cut Rate Groceries for America's Largest Grocery House. Outfit Free. Standard Grocery Co., 352 Arcade, Cleveland, O.

THE NEW "SWIFTLIT" GAS LAMPS light instantly with match like city gas; no alcohol used; radically different from any other; portable or systems, 100 to 1,000 candle power; will; burners cheap for old lamps; Agents making money; great novelty; wholesale price for introduction, Planet Mfg. Co., Dept. 4, St. Louis. (Established 1868.)

BIG MONEY IN SELLING USED AUTOMOBILES—No business so easy to learn, so profitable, so congenial. On \$50 to \$200 investment our Agents make \$50 to \$150 per week. We furnish the cars and teach you how to drive, sell and repair them. Write to-day for particulars and territory. The Automobile and Cycle Company of America, 1769-1787 Broadway, New York City.

AGENTS SELL NEW NECESSARY ARTICLES, splendid chance to establish a permanent business. 10c for sample and particulars. Avalone & Co., 202 S. Clark St., Chicago.

AGENTS—EARN \$5 TO \$10 per day selling our specialties; every woman will buy; Don't delay, write to-day for our free sample offer and catalogue. H. Nelson Specialty Co., 1804 Maubert Ave., Los Angeles, California.

AGENTS—A new fast selling specialty for mechanics, office men, and every one who works. Something out of the ordinary. Demand already created. 400% profit. Samples 10c. La Rue Soap Co., 584-D, Niagara St., Buffalo, N. Y.

PORTRAIT AGENTS find our plan beats all others. Prompt shipments—refunds credited. 30 days' credit. Catalogue of Portraits, Frames, Pillow Tops, Sheet Pictures and samples free. James C. Bailey & Co., Desk 68, Chicago.

AGENTS SWAMPED WITH DOLLAR BILLS. New dollar home invention. Men—Women make \$10 daily. Experience unnecessary. Just what you want—sells like "sixty." Jones sold 2 first hour; (made \$7.20). Howe, 25 before noon. Takes every woman by storm. Great excitement. Season's greatest success. Just think! A Self-Drying, Self-Cleansing Mop, without cogs, gears, wheels, knobs, springs, hinges. One simple operation, presto! it's wrung all over. Interchangeable—use any mop cloth. Mechanical victory—triple triangles. Once used never discarded. All mop ideas revolutionized—beaten to a frazzle. As one lady writes, "Simply perfect and perfectly simple." Agents swamped with dollar bills; 150 per cent profit. Hurry—don't let your county get away. Investigate. Write today for exclusive agency offer. It's free. Triangle Mfg. Co., 8 Triangle Bldg., Toledo, Ohio.

10,000,000 U. S. HOMES NEED The Aladdin Mantle Lamp because they burn kerosene. Using less oil than ordinary lamps, the Aladdin outshines gas or electricity. Sells itself on overnight trial. Ball sold 850 on money-back guarantee. Not one returned. Sample lamp furnished. Write quick for agency proposition. Mantle Lamp Company, Dept. 118-L, Chicago.

AGENTS HAVE STEADY INCOME selling our novelty changeable signs, gold and silver letters; in demand everywhere. Catalogue. Climax Novelty Co., 452 Gay Bldg., St. Louis.

AGENTS TO SELL GUARANTEED GROCERIES at Wholesale direct to Consumers. Big pay, steady work. We sell Best Goods on earth. Save customers 25%. W. W. H., Hitchcock-Roll Co., Chicago.

AGENTS—BEST 25c seller on the market; over 100% profit; field unlimited; 10 a day easy. Silver Co., 303 N. Michigan Ave., Chicago.

BIG PROFITS—Exclusive territory, not in stores. The Magic Cooker—outsells all other household specialties. Belden Supply Co., 17 E. Lake St., Chicago.

A GASLIGHT BURNER for kerosene lamps; perfectly safe. No mantle; no chimney. Samples to all who mean business. Luther Mfg. Co., Dept. 45, Cincinnati, O.

YOU CAN MAKE \$\$\$\$ as our general or local agent. Household necessity; saves 80 per cent; permanent business; exclusive territory; salary or commission; free sample; credit. J. Pitkin, Newark, N. Y.

SIGN PAINTING SELF TAUGHT—Outfits \$1.50 up, a trade that is not overcrowded; samples and particulars 5c stamp. Rescent Sign Co., Box 382-G, Fall River, Mass.

AGENTS—PORTRAITS 35c, FRAMES 15c. Sheet Pictures 1c. Stereoscopes 25c, Views 1c. 30 Days' Credit. Samples and Catalog Free. Consolidated Portrait, Dept. 1193, 1627 W. Adams St., Chicago.

AGENTS—NEW HOUSEHOLD SPECIALTY. Big profits. Easy sales. Repeat orders. Sample free. Box 49, Zenith Supply House, Morgan Park, Ill.

WANTED—LIVE AGENTS for new article. Liberal commissions. Sells anywhere. Stephenson Specialty Co. (not Inc.), German Valley, Ill.

RAINCOATS—To order from Mill to Wearer; write for particulars and samples. Agents wanted. Seagull Raincoat Co., Gaither Building, Baltimore, Md.

WANTED: Salesmen on our New Census Publications. Splendid opportunity. Men making \$50 to \$75 per week. Rand McNally & Co., Dept. B., Chicago, Ill.

JOKER ARTICLES, TRICKS AND PUZZLES. Illustrated Catalogs. Prices and 2 samples, 15c. New Idea Novelty Co., Desk A, 28 Warren St., New York.

GOOD AGENTS WANTED for the Self Indicating Adder. Price \$3.50. Particulars free. O. Bassett, 5921 Indiana Ave., Chicago.

AGENTS—DON'T accept an agency until you read our new book, "Piling Dollars;" It's Free. Darling Bros., Derry, N. H.

WANTED—HONEST MEN in every locality to represent us on Baking Powder. Experience unnecessary. Good opportunity. Prudential Baking Powder Co., Hudson & Canal Streets, N. Y.

AGENTS MAKE \$20 PER DAY selling the All-Purpose Wrench. Every Wrench in One. Indispensable to mechanics. Write, Universal Wrench Co., Denver, Colo.

\$50,000 CAN BE MADE in a county, building my patented overflow concrete bridges, cheaper than steel. Agents can make \$1,000 per month selling territorial rights. C. Horton, Belle River, Ill.

GENERAL AND LOCAL AGENTS—We control a new manufactured article with a great future. Profits that will astonish you. 15c sample free. United Sales Agency, Franklin, Penn.

AGENTS WRITE TODAY. We will positively show you how to make \$25 every day. Lehigh Specialty Co., South Bethlehem, Pa.

AGENTS GREATEST OPPORTUNITY; our fast selling line gives you \$1.00 profit on every sale of \$1.75. Watertown Supply Co., Watertown, Wis.

LIVE AGENTS to sell Wholesale, Patented Household article. D. Schaefer Mfg. Co., 889 23d St., Milwaukee, Wis.

WANTED MANUFACTURERS AGENTS calling on the automobile trade to sell Men-Do and our other tire necessities. Liberty Rubber Co., Orange, N. J.

\$100 MONTHLY and expenses to trustworthy men and women to travel and distribute samples; big manufacturer. Steady work. S. Scheffer, Treas., M. W. Chicago.

AGENTS—Increase your profits by adding our high-grade line of rapid selling household necessities. Quick sales and good profits. Write for catalogue and proposition. Northwest Specialty Supply Co., 1701 Blair St., St. Paul, Minn.

AGENTS—Our specialties net live men and women \$5 to \$12 daily. Attractive year round sellers. 100% profit. Particulars free. Armstrong, Box 495, Springfield, Ohio.

I MADE \$18,000 in three years in Mail Order business. Free booklet, tells how. H. System, Marlon, Ky.

GREAT SUIT OFFER! Just write us and we will send you absolutely Free, by return mail, postpaid, a large outfit containing a big variety of cloth samples, fashion figures, tape measure, order blanks, etc. Everything Free, and we will start you in a paying business. A most liberal offer on a suit for yourself that will make you wonder. Terms, conditions and privileges that will astonish you. We will name you so much lower prices on men's fine clothing that it will surprise you. We want a live agent in your town. You can make \$1,000 to \$2,000 per year. If you will write us before we get an agent in your town you will get a wonderful offer. As soon as we get an agent in your town he will get profits on every dollar we sell in his territory. We turn all our business over to him. That's why our agents make so much money. If you want a suit for yourself, answer Quick before we get an agent in your town, you will then get all of our great inducements. Address Dept. 468, American Woolen Mills Co., Chicago, Ill.

EXCLUSIVE TERRITORY—HOUSEHOLD NECESSITY—repeats for life—140% profit—sample, 10c. Nichols and Stone, Worcester, Mass.

WANTED—Agents to sell teas and coffees. Burns & Reed, 209 Hudson St., New York.

HERE'S THE LIVE AGENTS SELLER, needed in Homes, Offices, Factories, Rapid seller, 100% profit. Eleven cents brings sample and particulars. John Brent, 353 Center St., Chicago.

AGENTS—\$18.00 WEEKLY, collecting names, soliciting, delivering; Pillowtop portraits, pictures, frames; New plans free. Manager, Family Portrait Co., Wayne, Ill.

AGENTS MONEY-MAKING INFORMATION book and formulas. This copyrighted \$1.00 book sent postpaid to every agent for 25c silver. John H. Taylor Co., Detroit, Mich.

SMALLEST ALARM CLOCK, bible and telescope, 10c each prepaid. W. H. Garner, A-119 South Lafayette St., Evansville, Indiana.

MEN AND WOMEN EVERYWHERE make big money selling our new household specialties. Free particulars. Write today. Douglass Merchandising Company, Dept. 1, Cape May Court House, N. J.

EASY PIN MONEY! Easy Premiums! Particulars Free! Alvin Card Co., Conneville, Pa.

AGENTS: DON'T HESITATE; write at once. We positively show you how to make \$6.00 to \$25.00 daily. Geo. R. Hoagland Co., 928 Wyandotte St., Kansas City, Mo.

FREE INSTRUCTIONS to make Mexican finger rings; most beautiful hand-made novelty. Sample ring, 25c. Particulars for stamp. Address, Western Bead Goods Co., D. 2, Box 637, Kansas City, Mo.

DRY GOODS REMNANTS at bargain prices. Woolens, silks, and other quick-selling materials at half price. Big opportunity for agents and storekeepers. Remnant Store, 1301 Linn St., Cincinnati, O.

POCKET CASH REGISTER and Rapid Change Purse. Smart, convenient and everlasting. Adds up or down. "When Empty Looks Full of Gold." Splendid side line or exclusive specialty. Agents sample and "Sixty-six reasons Why" 50 cents. Pocket Cash Register Company, P. O. Box, 1969, Los Angeles, Cal.

KEROSENE MANTLE LAMPS—1912 model; superiority guaranteed. Burners fit common lamps. We sell mantles for all mantle lamps; get our prices. Guilford Co., Seville, Ohio.

WANTED—OFFICE EMPLOYEES, EITHER SEX. Legitimate proposition, no novelties. Repeat orders. Work spare time. Work remunerative and pleasant. Send 25 cents to cover cost and mailing of samples and contract to Agents. Keen Edge Manufacturing Co. Ltd., 1018 Arch street, Philadelphia, Pa.

AGENTS, BIG MONEY FOR YOU selling new style self-filling Fountain Pens. Sample, 25c. Particulars free. Barney Gifford & Co., St. Paul, Minn.

AGENTS, ABSOLUTELY NEW, useful, novel invention to use menthol for headache, colds, etc. Greatest agents' article on earth. Secure territory. Sample, 10c. Anderson Mfg. Co., Billerica, Mass.

AGENTS WANTED to sell our beautiful Floral Wall Mottos. Occidental Co., 106 Washington Bldg., Seattle, Washington.

GATHERING INFORMATION in your locality pays big money. Either sex. Particulars free. National Information Bureau, Drawer 15, Sta. A, Columbus, Ohio.

HOME BUSINESS. Collect names, information, etc., for business concerns. Steady income. Instructive booklet for stamp. Information System, 269, Marietta, Ohio.

SUCCESS IS YOURS if you work our new mail order plan. Particulars free. Write today. Chromatoscope Co., Dept. B, Norwalk, Conn.

WEeping DOLL. Latest patented toy, very laughable. Progressive Novelty Co., Roslindale, Mass.

ENVELOPE MOISTENER, NO-WHITTLE PENCIL! Self-selling. Sample, terms, 10c U. S. coin. Apex Sales Company, 1224-26 17th St., Denver, Colo.

AGENTS—Embossed Gold and Silver Sign Letters. Immensely profitable. Sample free. Johnston Co., Quincy, Ill.

\$25 WEEKLY and expenses to men and women to collect names, distribute samples and advertise. Steady work. C. H. Emery, M. R., Chicago, Ill.

A BIG WINNER FOR AGENTS: 7-in-1 Nickel Plated Combination Tool Key Ring; screw driver; bottle cap opener, envelop opener; pipe cleaner; cigar cutter; nail cleaner. Most useful pocket novelty invented. Sells itself. Sample 10 cents. Joseph Mathieu, 203 Court St., Brockton, Mass.

WANTED RELIABLE PERSON IN EVERY CITY. Either sex to push the sale of new patent household articles; new ironing device; keyless door locks; umbrella clothes bars; combination shirt and trouser hanger; folding sleeve board; ideal roaster; sanitary water proof rings; etc. \$5 to \$15 daily; easily made. Now is the time to get started. For particulars address, Dexter Supply Co., 508 S. Dearborn, Chicago.

AGENTS WANTED for the most rapid selling household article. ("The King Duster.") Every woman will buy one on sight. Extra commission; new proposition. Write Guard Sales Co., Phoenixville, Pa.

PICTURE AGENTS LOOK! \$10 daily selling our new copyrighted "Little Shepherd," "Negro Angel," "Jack Johnson," and 12 other negro pictures. Portraits 25c, 16x20 Frame 15c. Pill-tops 35c. We help beginners. Catalogues. Sample free. Berlin Art Association, Department 76, Chicago.

WANTED—COUNTY REPRESENTATIVES for Success Hand Vacuum Cleaner. Superior to any Cleaner made either Hand or Power or Stationary Plant. We prove this in any contest. Largest Hotels using Success Cleaners. Biggest kind of Profits. Hutchison Mfg. Company, 312 Wood St., Wilkesburg, Pa.

AGENTS WANTED—SELL RICH LOOKING imported 36x68 rugs, \$1 each. R. H. Carter, Milan, Tenn., sold 115 in four days; his profits, \$51. You can do as well. Write for sample offer and unique selling plan; exclusive territory. A. Condon, Rug Importer, Stonington, Maine.

AGENTS—\$50 weekly; we manufacture the best needle case made; a wonderful seller; 200 to 500 per cent profit; talking unnecessary; our copyrighted "Trust Scheme" Envelopes do the work; general agents can make over \$100 weekly; send 10c for a 25c sample containing 115 needles; particulars free; buy direct from the factory at wholesale. Paty Needle Co., 102 Union Sq., Somerville, Mass.

AGENTS—Earn \$25 daily easily; write immediately for booklet; new patented specialty which doubles life of auto tires. Murray Co., 418 E. 31st St., Chicago.

WANTED—Both sex to sell Nickel-Aluminum Nameplates, no experience necessary, 100% profit. Public demands them over every door bell, price and style will sell thousands. Your name on sample with particulars, 20c. Clarence Hardage Mfg., Syracuse, N. Y.

(CELLULOSIA) DOOR PLATES, new, lettering pure gold. Send for sample case. Nothing invested, 100% profit; sell to every house. Public demand them. La Fontaine, Inventor and Mfr., Sherburne, N. Y.

GET BUSY, LEARN TO MAKE NAME PLATES, house numbers, etc. Make \$15 a day. Send for free booklet. Sixty illustrations. E. E. Palmer, Wooster, O.

WANTED—BOYS AND GIRLS to sell a very useful article which we are introducing. Cash paid for services. \$1 per evening, easily earned. Domestic Supply Co., Butler, Pa.

BOKARA DIAMONDS—Agents, everyone, wear and sell our famous Bokara Diamonds; write for sample offer and catalog free. Northwestern Jewelry Co., 52 Northwestern Bldg., Chicago.

KING MONEY MAKER. Particulars free. Godley Specialty Co., Chatham, Mass.

AGENTS—EITHER SEX. Legitimate. Address Dr. A. I. Clarke, 1840 Hammond St., Chicago.

50,000,000 PEOPLE are looking for the "Eversharp" Automatic Pencil, 100% profit. Write immediately for particulars or send a dime for sample. H. Kimball, 72 Hamilton Bldg., Paterson, N. J.

SIGN LETTER AGENTS, PAINTERS. Something new and better; Attracto Gold or Silver Letters. Look like Sign-writer's work, cost less, wear better. Anyone can apply them. Big money lettering store windows—making glass signs. Samples free. Attracto Sign Co., Kemper & Orchard, Chicago.

BECOME A MILL AGENT. We manufacture Triplewear Hosiery—outwears 3 ordinary kind, replaced free when hole appears. Large profits. 1st reply obtains agency your town. Write today. Triplewear Mills, Dept. D, 724 Girard Ave., Philadelphia.

BOYS ARE MAKING from three to five dollars each week, acting as our agents. Certificate worth one dollar mailed to boys who write. Kutrite Co., Thirteen South Sixth Street, Minneapolis, Minn.

BIG PROFIT. To sell a compound that cleans and makes silverware as bright as new by dipping article once in solution. Just the thing for every household and hotels. Sample package with agents terms 10 cents (silver). A. Lagerstrom Supply Co., Cannon Falls, Minn.

WIDE AWAKE PEOPLE by writing at once we will show you how to earn big money, selling furs on an investment of \$15.50 for samples. The Merchants Fur Company, 186 N. La Salle Street, Chicago, Illinois.

WHY NOT EARN \$5 to \$25 daily? Others do it with our new specialty. Send for booklet. The Rellemurd Company, East Greenville, Pa.

START BUSINESS OF YOUR OWN. Last year I cleared \$6,000 in one small mail-order business. Valuable information free. Vance, Marion, Ky.

AGENTS—SELL THE SANITARY Steak Shredder, a scientific nickel-plated steel meat pounder. Retail 50c. Excellent Christmas gift; 120% profit. Specialty Manufacturing Co., Iowa.

AGENTS—Everybody buys our readymade Air Brush Show Cards. Write today for free catalog. Popular Show Card Co., Desk D, 1235 Michigan Ave., Chicago.

AGENTS—MEN AND WOMEN for newly patented legitimate; quick seller. Marshall, 648 Railway Exchange, Chicago.

400% PROFIT SELLING GORDON Photo Pillow Tops. High grade work. Samples and catalogue free. Luther Gordon Co., 164 Washington St., Chicago.

COMMISSION SALESMEN WANTED—Willing to earn \$10 per day; new novelty for Cigar, Candy and Drug trade. Write; White, 1235 Van Buren, Chicago.

AGENTS WANTED EVERYWHERE to sell high grade household specialties; no talking needed; sells on sight; send for catalog. Pequot Supply Co., Pawtucket, R. I.

AGENTS WANTED to introduce Matchless Gaslighters. Light nothing but gas. Sample 15c. Particulars free. Elwell-Shaver & Co., Dunkirk, N. Y.

NAME ON RUBBER STAMP, 15c; with address, 25c. National Stamp Works, 42 N. Fifth Ave., Chicago. Catalogue.

MINIATURE NOVELTIES—SMALLEST ALARM CLOCK Novelty Scale; Dutch Shoes; Telephone and Bible; 10c each. Globe Novelty Co., 18 Leavenworth St., Omaha, Neb.

AMAZING INVENTION—SOMETHING NEW—Handsome nickel plated lamp burner, scientifically made. Produces large, brilliant, steady, white flame. Rivals gas. Guaranteed smokeless odorless. Not a mantle. Can't break. Beats anything you ever saw. Brings you quick sales, large profits. Only 35c retail. Territory going fast. Particulars free. "Radiolite," 364 Colorado, Toledo, O.

SIGN PAINTING AGENTS, 1000% profit. Best and cheapest Window Letter made. Easiest mounted. Outfit free. Success positively guaranteed. Embossed Letter Co., 2563 Milwaukee Ave., Chicago.

AUTOMOBILE OWNERS—Be our agent and make from \$5,000 to \$20,000 a year. Our Air-Friction Carburetor will drive your car at two miles an hour on high speed; gives much more speed and power. Satisfaction guaranteed or money refunded. Air Friction Carburetor Co., Dept. W., Dayton, Ohio.

AGENTS: Send for free booklet, inside information on the agency business. Filled with money making plans. Pointers on experience of thousands of successful agents. Address J. A. Finch, 1162 3rd St., Dayton, Ohio.

FREE SAMPLE goes with first letter. Something entirely new. Every firm wants it. Orders \$1.00 to \$100.00. Nice, pleasant business. Write today. Metallic Sales Co., 406 N. Clark St., Chicago.

AGENTS—100% PROFIT—Genuine Leather Combination Purse, Billfold, Memorandum Book, Pencil, Identification Card, Sell at sight. Agents' sample 45c postpaid. LeRoy Specialty Co., 76 Park Place, Room 52, New York.

ONE MILLION AGENTS WANTED; fast seller costing 5c, selling 50c. Every firm needs. Orders to \$50. Postal bring samples. Embossed Co., 2497 Milwaukee Ave., Chicago.

AGENTS—We manufacture four of the most fascinating game boards ever invented. 100% profit, orders bound to repeat, nothing like them on market, slot machines beat. Particulars free. Unique Novelty Co., Independence, Iowa.

AGENTS WANTED—Send 15 cents for smallest Bible in the world and one of each of our catalogues, with agent's price. A. S. Mankin & Co., Alexandria, Va.

AGENTS WANTED to sell our beautiful scripture wall mottoes. Frank Shilling Co., Navarre, Ohio.

AGENTS MAKE \$30.00 WEEKLY selling our 500 Handy Household Articles; catalogue free. Scheff Company, 1637 Wells Street, Chicago.

\$DOLLARS\$ ADDER—Pocket Adding Machine. Wonderful seller. Guaranteed. \$1 postpaid. Globe Sales Co., N171 Leavenworth, Omaha, Neb.

WANTED—AGENTS, 7 cents profit each 10 cent sale; best little article ever offered; sample for 3 cents in stamps. Rawlings Box 945, St. Louis, Mo.

MAN CLEARED \$1182, Lady \$720, last six months, selling Holladay's Marvel Shoe Polish, selfshining, waterproof. Why not you? Write for demonstrated sample. P. M. Holladay, 25 W. 31st, New York.

SEE WHAT WE SAY under "Patent" heading. Swift, Attorney, Washington.

YOUR NAME AND ADDRESS on an air-cushion rubber stamp 20c. Including pad, 30c. Smith Supply, Waukegan, Ill.

ANYONE, ANYWHERE, CAN START a mail order business of their own. Make \$10 to \$50 a week during spare time; experience unnecessary; we, as manufacturers, start you and furnish everything. Patented great repeat order getters; sold exclusively to our co-workers; big profits; small capital; get in now on our new leaders and new plan; get in touch with full particulars. "Whole Truth" and sworn statement. Write today. J. M. Pease Mfg. Co., 193 Pease Bldg., Michigan St., Buffalo, N. Y.

MAIL ORDER ADS THAT PAY. 20 different propositions fully explained. All bona fide, sure-fire Money-getters. Each one the foundation of a successful Mail Order business. Send 10c for full particulars and regular bulletin of new propositions. Mail Dealers Wholesale House, 450 Franklin Bldg., Chicago, Ill.

MEN AND WOMEN WANTED to control exclusive agencies rapid selling, low priced specialty. Universal demand, plenty repeat orders; good profit to hustlers. Write for free sample and terms to-day. The G. V. Sales Co., Room 1325, 150 Nassau St., New York City.

I WILL START YOU earning \$4 daily at home in spare time silvering mirrors; no capital; send for free instructive booklet giving plans of operations. G. F. Redmond, Dept. 305, Boston, Mass.

AGENTS—HANDKERCHIEFS, DRESS GOODS. Carleton made \$8.00 one afternoon; Mrs. Bosworth \$25.00 in two days. Free samples. Credit. Stamp brings particulars. Freepress Mfg. Company, 59 Main St., Brooklyn, N. Y.

AGENTS WANTED in every county to sell Transparent Hand Pocket Knives. Big commission paid. From \$75.00 to \$300.00 a month can be made. Write quick for terms. Novelty Cutlery Co., 57 Bar St., Canton, Ohio.

AGENTS make big money selling our new gold letters for office windows, store fronts and glass signs. Any one can put them on. Write today for free sample and full particulars. Metallic Sign Letter Co., 406 N. Clark St., Chicago.

WIN NEXT \$1,200.00. We tell you how. \$40,000.00 already won by 10 inexperienced people. Storeman received \$1,200.00 one month, \$15,000.00 to date. Korsted \$2,200.00 in two weeks; Schleicher \$195.00 first 12 hours. Strange invention startles world. Gives every home a bath room with hot and cold running water for \$6.50. Abolishes plumbing, water works. Self-heating. Little wonder. Hart sold 16 in 3 hours. \$3,000.00 to date; Lodewick 17 first day. Credit given. Investigate today. Beat others to exclusive sale. Means fortune. Allen Mfg. Co., 383 Allen Bldg., Toledo, Ohio.

GENERAL AND LOCAL AGENTS: Here is your opportunity. Energetic men can make \$2,500 yearly and up. The Improved Canechester Kerosene Mantle Lamp revolutionizes old methods. Far superior to electricity, gas, acetylene or gasoline at 1/10 the cost. Burner fits all lamps. Safe; clean; odorless. Burns with or without mantle. Tested and pronounced by State of Pennsylvania "Most efficient light found." Greatest seller known. We want a few more live men in open territory. Canechester Light Company, Dept. P. M., 204 N. State St., Chicago.

LIVE AGENTS WANTED. A permanent income selling Koeth Combination Kit, 15 tools in one. Finest tool steel, guaranteed. Big profits. Wonderful seller. Exclusive territory. Send for free sample offer and terms. Currier-Koeth Mfg. Co., 52 West St., Coudersport, Pa.

AGENTS—\$50 weekly; we manufacture the best needle case made; a wonderful seller; 200 to 500 per cent profit; talking unnecessary; our copyrighted "Trust Scheme" Envelopes do the work; general agents can make over \$100 weekly; send 10c for a 25c sample containing 115 needles; particulars free; buy direct from the factory at wholesale. Paty Needle Co., 102 Union Sq., Somerville, Mass.

AGENT'S OUTFIT FREE. Quick profits. Best Handkerchiefs, Dress Goods and Fancy Goods on the market. Large Manufacturer. Particulars for stamp. Maricopa Mfg. Co., 93 Water St., Brooklyn, N. Y.

HONEST MAN OR WOMAN WANTED in every town to represent well-known wholesale firm. Experience unnecessary. Must furnish good references. Easy, pleasant work. Fair salary to start. McLean, Black & Co., 351 Medford St., Boston, Mass.

MEDALLIONS SELL AT SIGHT. 300 per cent to 500 per cent profit. Make up your own goods and be independent. "It's easy." Catalog free. Fred Resag Co., 1205 W. Randolph St., Chicago.

AGENTS—WE MANUFACTURE GLASS PAPER. Plain glass windows made to look like real stain glass; something new; easily applied; big money maker; two sample sheets of paper, with catalogue in colors and discount sheet, for 10c. S. H. Parrish & Co., 202 S. Clark St., Chicago.

WIDOWS, Ladies, Men. New Interesting. Profitable, easy work. Spare time or permanent. Sell our useful specialties. Our original selling plan will double your sales. Particulars and \$2.00 premium offer free. Fair Mfg. Co., HF51, Racine, Wis.

AGENTS—\$5 daily selling our Handy Tool, 12 articles in one. Lightning seller. Sample free. Thomas Mfg. Company, 462 Third St., Dayton, Ohio.

PERFECTION POCKET ADDING MACHINE. Lightning seller. Agents wanted. Cincinnati Specialty Mfg. Co., Dept. R., Cincinnati, Ohio.

SELF-THREADING NEEDLES. 10c a paper. Agent's samples and terms free. Ladies' Art Co., Dept. 41, St. Louis, Mo.

BLACKSMITHS

HIGH GRADE steel welding compound. Formula, 25c. H. O. Bass, Hillsboro, Ill.

GOOD BLACKSMITHS ARE SCARCE and few learning the trade and the blacksmiths must make the tools for all—from surgeon to the safe blower. Buy Toy's Modern Methods Forging and Welding different kinds of steel solid, and doing all hard jobs easy, also hardening and tempering to a standard by colored charts. Any smith can be an expert that means good jobs and big money. All for one dollar. Send for valuable samples free. W. M. Toy, Sidney, Ohio.

HELP WANTED

ARE YOU THE MAN? Here is your opportunity. No matter where you live—if you want to make big money and establish yourself in an independent business requiring no capital—we will teach you, by mail, all the secrets of the Real Estate Business including thorough Commercial Law Course, list with you readily salable properties, co-operate with and assist you to permanent success. Our 64-page free book fully explains our methods and tells what it means to be the local representative of oldest and largest Co-Operative Realty and Brokerage Corporation in the World. Write today to International Realty Corporation, 2034 Manhattan Building, Chicago, Ill.

WANTED RELIABLE MEN to learn Automobile Driving and Repairing in the largest and best equipped school teaching this trade. A most interesting, healthful and paying profession. Can be learned in a few weeks and at small cost. Competent men always in demand at salaries ranging from \$18 to \$35 a week. Our 32 page book "How to Drive" gives full particulars. Greer College of Motoring, 1457 Wabash Avenue, Chicago, Ill.

NEW USEFUL NOVELTY—Interests every user of telephone, umbrellas, tools, brushes, doors. Attracts crowds at Fairs; Window and Street demonstrations. Big profits. Nickeled pocket sample, 25c. Useful Holiday Gift, Handy Tool Holder Co., Warehous, Brooklyn, N. Y.

WE TRAIN DETECTIVES. You can be one. Splendid opportunities. Travel. Earn \$100 to \$300 monthly. This fascinating profession taught practically and scientifically by mail at a nominal cost. American School of Criminology, Dept. F, Detroit, Mich.

MEN WANTED FOR GOVERNMENT POSITIONS—\$30.00 a month. Annual vacations. Short hours. Steady work. Rapid promotion. Thousands of appointments coming soon. "Pull" unnecessary. Farmers eligible. Send immediately for list of positions open. Common education sufficient. Franklin Institute, Dept. P-21, Rochester, N. Y.

ELECTRICAL METERMEN WANTED IN EVERY STATE—\$900-\$1,500 yearly. Rapid introduction of Electricity creating new positions daily. We will fit you for splendid positions and assist you to get it. Booklet giving full particulars free. Write for it today. Fort Wayne Correspondence School, Dept. 20, Fort Wayne, Ind.

GOVERNMENT WANTS EMPLOYEES—10,000 appointments coming. Excellent salaries. Vacations. Write for list of positions open. Franklin Institute, Dept. P-21, Rochester, N. Y.

THE VULCAN SOOT CLEANER offers an exceptional opportunity for power specialty salesmen. We have openings for high-grade steam specialty men or mechanical engineers as representatives. G. L. Simonds & Co., 806 Steilway Bldg., Chicago.

WHY NOT PREPARE for Civil Service Examination? Teaching? Stenographer? Bookkeeper? Stationary Engineer? Electric Wiring? Electrical Engineer? Mechanical Engineer? Mechanical Draftsman? Electric Wiring? Matriculation. \$5. Tuition free. Mail course. Address Carnegie College, Rogers, Ohio.

EARN \$30 WEEKLY taking orders for Cut Rate Groceries for America's largest grocery house. Outfit free. Standard Grocery Co., 352 Arcade, Cleveland, O.

ALCA \$6.00 HAND VACUUM CLEANER wins first prize at all exhibitions. It is the finest agents' proposition in the land. Write for money-doubling contract. Alca Vacuum Cleaner Co., Dept. A, 366 W. 50th St., N. Y.

WANTED—Railway Mail Clerks. Average salary, \$1,100. Alternate weeks off with full pay. Examinations everywhere soon. Send for schedule of places. Franklin Institute, Dept. P-21, Rochester, N. Y.

SALESMEN, WRITE AND FIND out why our lines bring increased commissions over other lines. 35 salesmen wanted throughout the country and in large cities. Brice Williams Calendar Co., Kokomo, Ind.

WE START YOU IN a permanent business with us and run everything. We have new easy selling plans and reasonable leaders in the Mail Order line to keep our factories busy. No canvassing. Small capital. You pay us out of the business; large profits. Spare time only required. Personal assistance. Write today for plans, positive proof and sworn statements. J. M. Pease Mfg. Co., 191 Pease Bldg., Michigan St., Buffalo, N. Y.

WANTED—Active man in each locality to join this society and introduce our Memberships, Sick, Accident, Death benefits. All or spare time. \$50 to \$500 a month. Every Member secured gives you a steady monthly income. Box GA-293, Covington, Ky., U. S. A.

CAN YOU WRITE a Good Business Letter? Or Spell correctly? Have you command of English? Our Free Booklet 14 will tell you how to improve 100 per cent. Write for it today. School of Business English, Washington, D. C.

7,000 GOVERNMENT POSITIONS OPEN. Write for list. Franklin Institute, Dept. P-21, Rochester, N. Y.

GOVERNMENT POSITIONS offer steady, pleasant employment, big pay. Influence unnecessary. Get your preparation from former United States Civil Service Examiner. Write for big, free, descriptive booklet. Patterson Civil Service School, Box 826, Rochester, N. Y.

BIG MONEY WRITING SONGS. Thousands of dollars for anyone who can write successful words or music. Past experience unnecessary. Send us your song poems, with or without music, or write for free particulars. Acceptance guaranteed if available. Washington only place to secure copyright. H. Kirkus Dugdale Co., Dept. 265, Washington, D. C.

DANDY HOME BUSINESS. Collect names, information, etc., for business concerns. Steady income. Fascinating work. Instructive booklet for stamp. Information System, 261 Marietta, Ohio.

2,000 RAILWAY MAIL CLERKS WANTED. \$800 to \$1600. Examinations everywhere. Preparation free. Franklin Institute, Dept. P-21, Rochester, N. Y.

READ OUR ADVERTISEMENT under agents wanted. Pinless Clothes Line Co.

WANTED—Government wants Railway Mail Clerks. Average salary, \$1,100. Alternate weeks off with full pay. Examinations coming everywhere. Write for free sample questions and schedule of locations. Franklin Institute, Dept. P-21, Rochester, N. Y.

YOUNG MEN who desire to become professional base ball players write at once giving experience. American Base Ball Registration Bureau, Dept. A, 409 Phoenix Bldg., Minneapolis, Minnesota.

RAILWAY MAIL CLERKS WANTED—Average salary \$1,100. Write immediately. Franklin Institute, Dept. P-21, Rochester, N. Y.

WANT TO CORRESPOND with machinist, who wants to go in business, if you invest a little cash, will put you in charge of a good shop. Address, R. C., 6th floor, 318 W. Washington St., Chicago.

WANTED—DISTRIBUTORS of advertising matter everywhere. Oliver D. Barkley, Mount Pleasant, Pennsylvania.

I MADE \$18,000.00 in three years in mail-order business, free booklet tells how. H. System, Marion, Ky.

MEN AND BOYS TO LEARN AUTOMOBILE repairing, driving on up-to-date cars; electrical, civil engineering, surveying, in most practical way. Room and board while learning. Positions secured; satisfaction guaranteed; catalog free. National School of Engineering, 2110 West 7th, Los Angeles

CORRESPONDENCE SCHOOL, STUDENTS taking courses in Mechanical or Structural Drafting will learn something to their advantage by addressing G. Clair, 304 Lewis Building, Pittsburgh, Pa.

LIVE-WIRE SALESMEN everywhere for important new automobile specialty; field unlimited; liberal commission. Address, 463 Fourth Ave., Newark, N. J.

BIG FORTUNES MADE YEARLY in Mail Order Business. I make \$5,000 yearly from small start. My plan is free. Haynes, Marion, Ky.

WANTED, AGENTS, MACHINISTS, ATTENTION! Increase salary, new revised Saunders' Hand Book of Practical Mechanics. Best ever ready reference. Thousands in use. Postpaid \$1.00 cloth; \$1.25, \$1.50 leather flap. Big profits. E. H. Saunders, 216 Purchase St., Boston, Mass.

WANTED ONE THOUSAND CHAUFFEURS and repair men. Our demand for automobile engineers exceeds the supply. Calls for men of intelligence and mechanical bent capable of commanding \$100.00 to \$150.00 per month upon graduation. Resident course \$20.00 to \$60.00. Home Correspondence course completed by practical road and shop work at this school, highly successful. Look this up. Auto Schools of America, Dept. T, 1600 Michigan Ave., Chicago.

WANTED SALESMEN to sell Gasoline Lighting Systems; no experience necessary; attractive proposition. Dond Lighting Co., 174 No. Sangamon St., Chicago, Ill.

STOP HERE! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything and guarantee success. Send for proofs. Voorhies, Desk C. R., Omaha, Neb.

I WILL START YOU earning \$4 daily at home in spare time, silvering mirrors; no capital; send for free instructive booklet, giving plans of operation. G. F. Redmond, Dept. 306, Boston, Mass.

WANTED—A man or woman to act as our information reporter. All or spare time. No experience necessary. \$50 to \$300 per month. Nothing to sell. Send stamp for particulars. Sales Association, 601 Association Bldg., Indianapolis, Ind.

CEMENT

IF YOU WANT the best information on cement and concrete construction, subscribe for Concrete, leading cement and concrete monthly. Sample copy, 10 cents. Yearly subscription, \$1.00. Concrete, 135 Newberry Bldg., Detroit, Mich.

DOGS, POULTRY AND LIVE STOCK

HERE IS A PRESENT FOR YOU. A beautiful colored picture "100 chicks at play" and book "How to make money raising chickens." Send 10 money. Western Poultry Farm, 900 Harriet St., Winona, Minn.

TRAINED BEAR, DEER, FOX and Wolf Hounds. Forty page highly illustrated catalogue; four cent stamp. Rookwood Kennels, Lexington, Ky.

REGISTERED POLAND CHINA PIGS of large type. They are beauties. Write Alfred A. Neweg, Lols, Mo.

SCOTCH COLLIE DOGS. Send for list. W. R. Watson, Oakland, Iowa.

FANCY SINGLE COMB Buff Orpingtons. Inquire. Dane Hufington, Latham, Kansas.

COLLIE CATALOGUE FREE. White-Neck Kennels, Brownburg, Ind.

FOR SALE—"GENERAL ELECTRITE" 42934. Handsomest, best gaited Trotter in the South; good enough to head any herd; very reasonable to sell quick; investigate. M. A. Griffin, Penelope, Texas.

FLOUR, FEED AND MILLING MACHINERY

SPECIAL BARGAINS IN SECOND HAND: Attrition Mills, Burr Mills, Crushers, Corn Shellers, Bran Dusters, Dust Collectors, Purifiers, Reels, Double, Single 2 and 3-pair High Roller Mills, Sieve Bolters, Receiving Separators, Scourers, etc. Write for description and prices. Sprout, Waldron & Co., P. O. Box 429, Muncy, Pa.

MACHINERY AND TOOLS

REBUILT MOTORS—We have a number of second-hand marine engines of our own and other makes, completely rebuilt and guaranteed by us. As the builders of "Buffalos" are not in the second-hand engine business, we will sell them at less than factory cost to make room. This is a rare opportunity to get the highest grade of engines—2 to 100-hp.—cheap. Buffalo Gasoline Motor Co., 1284-96 Niagara St., Buffalo, N. Y.

FOR SALE—One 6 HP type "F," Single Cylinder Fairbanks-Morse, two cycle marine engine. Used less than one month. Perfect condition. Scheebler Carburetor. \$75. A. G. Langworthy, 900 S. Wabash Ave., Chicago, Ill.

HARRISON KEY FILING JIG, the greatest invention of the age. Enables anyone to make perfect duplicate Pin Tumbler Keys, no misfits, saves blanks; price within reach of everyone. Harrison & Co., 81 New St., N. Y.

FREE—"How to Run and Install Gasoline Engines." Greatest little book ever published on this subject, sent free with year's subscription to Gas Energy. Learn how to solve all knotty Gas Engine problems in few moments. O. L. Stevens, Ind., writes, Gas Energy is best magazine published. Send 50c for year's subscription. Book free. Gas Energy, 28 Murray St., New York.

CASTINGS \$6. 1 Hp. vertical-horizontal air-cooled gas-gasoline engine, including carburetor castings. Drawings 25c. Elgin Gas Engine & Machine Co., Elgin, Ill.

SCREW CUTTING LATHE ten by twenty-six. Complete, \$65. Wm. Rockwell, Eldred, Pa.

ELECTRIC LIGHT PLANT—12-hp., 2-cyl. Gasoline Engine, governors, magneto, pump, etc.; 1,500 watt dc.; Dynamo, rheostat, marble switch board. Installed last February. Price, \$375. Box 59, Dalton, Ohio.

FOR SALE: Small Screw Cutting Engine Lathe, Chuck and Tools. Fine condition. Bargain. John A. O'Brien, 420 Hydraulic Ave., South Bend, Ind.

TWO CYCLE, TWO CYLINDER, 4" x 3 1/2" Marine and Automobile, Gasoline Engines, Castings and drawings of same for sale. Richards Iron Works, Manitowoc, Wis.

DYNAMOS & MOTORS, any voltage or current; 500 direct and alternating current arc lamps, rebuilt and fully guaranteed. Get our monthly bargain list. Cash paid for electric machinery. Machinery Sales Co., 11 East Woodbridge, Detroit, Mich.

THE PATTERSON TOOL & SUPPLY CO., Dayton, Ohio, are specialists in furnishing equipment for automobile repair shops. Tell them your wants.

2 H. P. ENGINE and accessories, \$35, cash only. Address Box 116, Kingman, Kansas.

MIETZ & WEISS 7 hp. gas engine, \$135. Moulton, Monson, Mass.

PULLEYS, GEARS, SPROCKETS, Shafting Hangers; see page 138. W. A. Jones Foundry & Machine Co., Chicago.

BARGAIN in 2 cyl., 14 h. p. new marine engine. Completely equipped. Jack Thrig, Goshen, Ind.

50 REBUILT DYNAMOS and Motors. Box 161, Troy, O.

WILL SELL AT A BARGAIN for we have no further use for same. 45 hp. gas engine Westinghouse, with D. C. generator direct connected; also a producing gas outfit, produces at 1 1/2 per K. W.; all in first class condition. For further particulars, address Michigan Fibre Box Co., Battle Creek, Mich.

10 TON REFRIGERATION MACHINE complete with all fittings, receiver, traps and condenser. Cost to install, \$3,100. Will sell for \$850. R. Pinner, 122 Water St., New York, N. Y.

AN ALTERNATING CURRENT MOTOR, easy to build on 9" lathe. 1/2 hp., 110 volts, 60 cycle; blue-prints and instructions. \$1.50. G. S. Haley, 120 S. Edward St., Decatur, Ill.

ENGINES, 16"x36" Corliss, \$475; 28"x48" Corliss, \$1,500 18"x24" slide valve, \$425. R. Pinner, 122 Water St., New York, N. Y.

THE LATEST IMPROVED WATER MOTORS. We have them all sizes; write today for catalogue. Haller Manufacturing Co., Gee Ave., Pittsburgh, Pa.

BOILERS, Babcock & Wilcox, 4-200 hp.; complete, \$1,000; set of two. R. Pinner, 122 Water St., New York, N. Y.

FOUR HP. GASOLINE ENGINE; complete equipment; highest offer takes it. Ernest Jones, Jr., 914 N. McKinley Ave., Canton, Ohio.

HEATER, Berriman, 150 hp.; \$100. R. Pinner, 122 Water St., New York, N. Y.

WE ARE GOING TO SELL at a bargain Machines for making packing boxes of fibre board, boxes made with wooden frames. If you are interested write at once for it will sell fast for the price we ask. Address Michigan Fibre Box Co., Battle Creek, Mich.

PUMPS—CAMERON, 12"x7"x13", \$185; 10"x8"x13", \$175. 8"x9"x13", \$165. R. Pinner, 122 Water St., New York, N. Y.

USED AND REBUILT LATHES, drills, millers, shapers, planers, new and rebuilt marine and stationary engines, new wood working machinery, punches, shears. State exactly machine you wish to purchase. Bicknell Mfg. & Supply Co., Janesville, Wis.

MODEL STEAM TURBINE—All parts (in rough) necessary to make a model Steam Turbine, and blue-print of same for \$1. Address Midget Machine Co., P. O. Box 214, Elizabeth, N. J.

FOR SALE—One 5 ton belt driven refrigerating machine. Two 24-inch band saws. Geo. J. Adams, 39 South St., N. Y.

13 5-HP. STEAM ENGINES \$12 each. Lucas & Son, Bridgeport, Conn.

FOR SALE—Rebuilt; Throttling, Automatic and Corliss Engines, Boilers, Pumps, Heaters, Machine Tools, Tanks, Saw Mills, and general machinery, at bargain prices. Let us know your wants. The Randle Machinery Co., 1761 Powers St., Cincinnati, Ohio.

VERTICAL STEAM ENGINES, 2 to 25 hp. Send for circular. E. T. Frank & Son, 642 W. Pratt St., Baltimore, Md.

ENGINE CASTINGS, 1 1/2 horse vertical gasoline, air-cooled, \$7. Three horse marine water-cooled, \$9 cash; drawings included; catalogue for stamp. Novelty Manufacturing Co., 858 West Sixth St., Cincinnati, Ohio.

FOR SALE—Gasoline Engines, automobiles, marine and stationary, also castings. Second hand ones taken in exchange and for sale. Apply with stamps. B. W. Richardson, R. No. 36, Peoria, Ill.

FOR SALE—Engine lathe, swings 9 1/2 in., takes 35 in. between centers. Complete with full set change gears to cut all sizes threads, 3 to 40 in.; price only \$43.50. Address L. F. Grammer & Sons, Allentown, Pa.

PATTERN-MAKERS! A book devoted to the principles of pattern and core making and molding. Written by G. H. Willard, a practical pattern maker of years experience. This book, just published, treats the subject in a much more simple, direct and effective manner than most books along this line. 224 pages, 312 illustrations. Price \$1.00 postpaid. Popular Mechanics Book Dept., Chicago.

SERIES OF 7 LITHOGRAPHIC MODELS—Steamship, Automobile, Gas Engine, Steam Engine, Steam Turbine, Wireless Telegraph and Dynamo. Size 8x14 inches. All parts of these machines are shown and numbered to correspond to printed keys of names. Price each 50 cents postpaid or set of 7, \$3.00 postpaid. Popular Mechanics Book Dept., 318 W. Washington St., Chicago.

MANUFACTURING MACHINERY

INVENTORS, WE BUILD MODELS, dies, tools and do light manufacturing reasonable and quick. Palmer Machine Works, 418 West 27th St., New York.

MACHINES DESIGNED AND IMPROVED, manufacturing cost reduced, practical, confidential, most every factory has something that is costing too much to make. Perry, 850 59th Street, Brooklyn, N. Y.

INVENTORS WE MAKE MODELS either Mechanical or Electrical; good work and low prices. Ludlow Model and Electrical Works, Ludlow, Ky.

CLEVELAND SPECIALTY & MANUFACTURING CO., Cleveland, Ohio. Manufacturers of Water Motors, Fans, Tapping Machines, Magnet Winders. Inventions developed. Special articles to order.

INVENTORS—WE BUILD MODELS, do experimental work, light manufacturing, dies and tools. Geo. Schwarz & Co., 123 Liberty St., New York.

INVENTIONS PERFECTED AND MANUFACTURED, best plant in South for same. Russell Machine Co., Dallas, Tex.

IRON, BRASS AND ALUMINUM CASTINGS, Metal Specialties. Patterns, Models, Polishing, Plating and Japanning. North Chicago Tool Works, North Chicago, Ill.

WANTED

WANTED—TO BUY Implement and Hardware business. Box 72, Shawville, Ill.

WANTED—Moving Picture outfit. Fred L. Smith, Amsterdam, N. Y.

FOR SALE

TO WHOLESALE and trade in general. We are introducing new patented articles on the market. Send for list of same and also for catalogue of Typewriters, Motorcycles, Engines, Musical Instruments, etc. Atlantic Supply Co., Long Branch, N. J.

FOR SALE CHEAP—Moving Picture machine outfit used only one week. Underwriters model. Must sell at once. No reasonable offer refused. Write Quick. L. Worden, 52 Ceape St., Oshkosh, Wis.

PUNCHING BAGS, PENNY PICTURE MACHINES, Microscopes, Lifting, Hatblower, Lung-tester and Name plate Machines. Robert More, Bridgeton, N. J.

EXHIBITOR'S STEREOPTICON, fully equipped for theatre, Church or school, \$109. Worth \$350. Orr, West Park, Ohio.

ONE 1/2 H. P. DC MOTOR; Two 220 DC Ceiling Fans; One Gas Coffee Roaster. Address: Vinnege Coffee Co., Ft. Worth, Tex.

1/4 PRICE ON TYPEWRITERS, phonographs, motorcycles. Easy payments; get list. Knights, 263 12th, St. Louis, Mo.

FOR SALE—40 mated Homer Pigeons, \$15. 130 disk phonograph records, 20c each. R. S. P. 235 Jackson St., Topeka, Kans.

CADILLAC 5 PASSENGER, Cornet, Trombone, Banjo, Talking machine, Telescope, Picture machine. P. G. Hodge, R. F. D. 1, Fitzwilliam Depot, N. H.

FOR SALE—Big Moose Head, newly mounted, \$25. R. Sayler & Son, 497 South Broadway, Dayton, Ohio.

RENEW DRY CELL BATTERIES: No fake. Cost 1c each. Two guaranteed formulas, 15c each or both, 25c. L. M. Kachel Co., Dept. B7, Whitewater, Wis.

NEW CRETORS POPCORN WAGON, \$700; Locomobile gear, body and boiler, \$20. Fisher, 147 Erie Street, Warren, Ohio.

CALIFORNIA GEM CRYSTALS, cut stones and minerals for sale. If lots on approval are desired, give reference. Albert Everitt, Escondido, California.

CROSS, REAL ESTATE COURSE, also Typewriter. George Winstel, 1824 Pleasant Street, Cincinnati, Ohio.

FOR SALE—Moving picture film, 1c foot; machines, \$40. H. Davis, Watertown, Wis.

FRANKLIN TYPEWRITER for sale. A 1 condition, \$10.00 cash. Camera to exchange for single barrel gun. R. Cowles, Canton, Conn.

SALE OR EXCHANGE

AMATEURS' ELECTRICAL OUTFIT, including Wireless, for Aeroplane Engine. William Haynes, 102 N. Florence St., Springfield, O.

EXCHANGE. Moving Picture outfit for Aero Engine or Motorcycle. H. Klesling, 616 Centre, Williamsport, Pa.

FOR SALE—Fine Lowendall violin for \$50 or trade on gasoline engine. S. W. Alter, Forest, Ohio.

TWIN INDIAN, MOTORCYCLE; one hp. steam engine; typewriter; camera. Want diamond, printing press. Ulysses Fortier, Tulsa, Oklahoma.

THOROUGHRED POULTRY for second-hand Shop Tools. Wardwells Poultry Yards, Rutland, Vt.

FOR TRADE—\$20 Camera. Want 3 Horse Artmac engine; any condition. C. Hall, Covert, Kans.

PATENTS

INVENTORS! How to Win Fortune by Inventing is a handsome book of 214 pages containing 22 specific lessons of inestimable value to the earnest endeavorer. Price, \$1. Free to clients. Write for sample pages. Charles Labofish, Patent Attorney, Washington, D. C.

EVERY ONE NEEDS Hiscox's "Mechanical Movements." It describes and illustrates every known Mechanical Movement. Price, \$2.50. Circular on request. Henley Publishing Co., 132 Nassau St., New York.

INVENTORS—Send copy of your patent, etc., and we will send contracts outlining our special offer to market your invention. Atlantic Supply Co., Long Branch, N. J.

SEND FOR FREE BOOKLET. All About Patents and Their Cost. Shepherd & Campbell, 500A Victor Bldg., Washington, D. C.

\$100,000 for a simple invention. Alex. Wedderburn, Patent Attorney, Washington, D. C.

INVENTORS WISHING to sell outright or royalty, communicate. Engineer, Boulevard & 26th Street, Bayonne, N. J.

THE INVENTORS' OUTLOOK tells the truth about patents; not an attorney's magazine. A full illustrated description of Patent Office and its workings in next issue. One dollar a year. Subscribe at once. Inventors' Outlook, Washington, D. C.

NO ATTORNEY'S fees until patent allowed. Free search and books. Fuller & Fuller, Washington, D. C.

MODELS made for inventors. Low prices. Howard Merryman, Towson, Md.

WE SELL PATENTS. Established ten years. To buy or having one to sell write Charles A. Scott Co., 1096 Granite Bldg., Rochester, N. Y.

PATENTABLE IDEAS WANTED—Send for 3 free books. Richard B. Owen, 39 Owen Bldg., Wash., D. C.

PATENTS BUILD FORTUNES FOR YOU. Our free booklets tell how, what to invent, and how to choose an attorney. Best bank and other references. All business strictly confidential. Write today. D. Swift & Co., 317 Seventh St., Washington, D. C.

PATENT YOUR IDEAS, no unnecessary delay. Reasonable. Best references. Send for free book. Williamson & Williamson, 1325 Arch St., Philadelphia, Pa.

PATENTS SECURED—Reports on patentability, validity and infringement. Patent suits conducted. C. L. Parker, ex-examiner Patent Office, 910 G St., Washington, D. C.

PATENTS FOR SALE

FOR SALE U. S. PATENT No. 949306, also Canadian Patent 131535 on Spring winding Machine; will be money maker and to competition whatever. For particulars address, Fred Schaefer, 734 North 77th St., Seattle, Wash.

U. S. PATENTS covering auto-electric block system signals, and railway crossing signals. Successfully tried out. A big thing for some one. If interested, write E. A. Gardner, Crystal River, Fla.

FOR SALE—CANADIAN PATENT No. 133681, United States No. 977704 on spring clip for securing reinforcing bars used in construction. James L. Brownlee, P. O. Drawer No. 7, The Dalles, Oregon.

FOR SALE CASH OR ROYALTY—The New Legless Adjustable Bed Table, Reading and Writing Desk. Frank Hadley, 2903 West Chicago Ave., Chicago, Ill.

FOR SALE; \$5,000 buys patent No. 936533 on combined Ironingboard, stepladder, washbench, clothesrack. Newton Stafford, Altamont, N. Y.

U. S. PATENT NO. 975335, a valuable house-hold article, will fill a Universal want, nothing similar; for sale outright cheap or exchange for late model Auto. H. K. Dial, 505 Main St., Tifton, Ga.

FOR SALE, UNITED STATES PATENT No. 988,413, for non-refillable bottle. Address, James Veno, General Delivery, Vancouver, B. C., Canada.

HANGER for electric conduit pipe. Patent for sale. A meritorious article. Address: Gen. Nilsen, 108 West 124th St., New York, N. Y.

FOR SALE my right to make and sell a new Triphammer 1/4 million. Blacksmiths want one. S. K. Jensen, El Campo, Texas.

FOR SALE or Exchange, Patent No. 789,085, Improved Bagging Machine. H. H. Dary, Schenectady, N. Y.

HOUSEHOLD ARTICLE—\$250 buys U. S. Patent. Can be handled with small capital, mail order or agents. Frederick M. Furber, Beaumont, Mass.

PATENT FOR SALE "Injector" internal combustion engines. Smith, 812 Greene Ave., Brooklyn, N. Y.

FOR SALE PATENT No. 985557, Improved bolt-holders. For particulars address C. T. Tarver, Hollywood, Ark.

HOG HOLDER No. 959,422, price reasonable. J. O. Bechdel, Portland, Ind., R. R. No. 5.

CANADIAN PATENT 123035, Water Motor, A. C. Kaiser, 318 Tremont Building, Boston, Mass.

VALUABLE PATENT JUST ISSUED, for sale or let on royalty license; the article is a novelty in the line of automobile tools; unlimited demand; inexpensive to manufacture; a money maker; have other good inventions and perfect models for demonstration. P. O. B. 104, Menominee, Mich.

FOR SALE—U. S. Patent, Magazine Smoking Pipe, highest bidder gets this simple invention; make offer quick. J. Lloyd Prunty, Wamego, Kansas.

FOR SALE ON ROYALTY. Novelty patents. Hood Mfg. Co., Boston.

PATENT ATTORNEYS

PATENTS PROCURED AND POSITIVELY SOLD if the idea has merit; all countries; satisfied clients my best references; a good invention properly protected by patent should prove very profitable to the inventor; protect your business against competition by patenting any new manufacture, process, formula, or article associated with it; capitalize your ideas; perfect, patent and market your new ideas; send sketch today; book free. H. Sanders, Grilly Building, Chicago, Ill.

PATENTS OBTAINED by competent and reliable attorney. Personal attention given to each client. Communications strictly confidential. Fees very reasonable. A. W. Foote, Room 2008, 165 Broadway, New York City.

"MONEY IN PATENTS" tells the truth about the subject. It is free to inventors. Write today. Herman A. Phillips, 1101 L & F Bldg., Washington, D. C.

PATENT WHAT YOU INVENT.—It may be valuable. Write me. No attorney's fee until patent is allowed. Estab. 1882. "Inventor's Guide" Free. Franklin H. Hough, 522 Loan & Trust Bldg., Washington, D. C.

PATENTS SECURED or Fee Returned. Send sketch for Free Expert Search and Report as to patentability. Books on inventions and patents, and reference book sent free. John S. Duffie & Co., Dept. 1, Washington, D. C.

"PATENTS AND PATENT POSSIBILITIES," a 72-page treatise sent free upon request; full of valuable and interesting information; tells what to invent and where to sell it. Write today. H. S. Bitt, 905 McGill Building, Washington, D. C.

IDEAS HAVE MADE FORTUNES. On request I will send my "Inventor's Pocket Companion," telling how to use Your Idea to greatest advantage. Patent Secured or Fee Returned. Write today. Wm. N. Roach, Jr., 502 Metzgerott Bldg., Washington, D. C.

PROTECT YOUR IDEAS. Inventor's Primer free. Free search and contingent fees. Milo B. Stevens & Co., estab. 1884, 685 F St., Washington; 353 Monadnock Bldg., Chicago. Guaranteed by Bankers Register.

THE PATENTOMBE tells all about patents and how to get them. Free on request. Established 1865. Anderson & Son, Patent Solicitors, 727 G Street, Washington, D. C.

IMPORTANT NOTICE—Read my page ad on page 118 Advertising Section of this magazine, relative to patents, trademarks, etc. Special offer contained in the ad. E. E. Vrooman, Patent Lawyer, Washington, D. C.

PATENTS. Advice free. 30 years' experience. Send for book. Edgar Tate & Co., 245 Broadway, N. Y.

PATENTABLE IDEAS WANTED.—Send for 3 free books. Richard B. Owen, 30 Owen Bldg., Wash., D. C.

PATENTS—Books How to Obtain and Sell Patents, with 100 mechanical movements; mailed free. F. Dieterich & Co., Lawyers, Washington, D. C.

PATENTS—HERBERT JENNER, patent attorney and mechanical expert, 608 F. St., Washington, D. C., established 1883. I make a free examination and report if a patent can be had and exactly what it will cost. Send for circular.

C. L. PARKER, Patent Attorney, Ex-examiner U. S. Patent Office, 910 G. St., Washington, D. C. Inventor's handbook "Protecting, Exploiting and Selling Inventions" sent free upon request.

PATENTS THAT PROTECT and pay. Advice and books free. Rates reasonable—Highest references; best results. Watson E. Coleman, Patent Lawyer, 622 F. St., N. W., Washington, D. C.

PATENTS WITHOUT ADVANCE ATTORNEYS' FEES. Send sketch for free report. Books free. Fuller & Fuller, Washington, D. C.

PATENTS; gas engine, motor vehicle and aeronautical work a specialty. John O. Selfert, Solicitor of Patents., 500 Fifth Ave., New York City.

PATENTS, TRADE MARKS, COPYRIGHTS, terms low. C. Tillman, 32 N. Clark St., Chicago.

REAL ESTATE AND FARM LANDS

OWNER MUST SELL BEAUTIFUL 6-ACRE Florida farm. Four acres, winter vegetables, one acre two-year-old fruit trees. On splendid shell road near shipping point. Yearly income, \$1,500 net. Also my winter home, small, neat cottage, built two years on good lot 150x50 in beautiful, modern Florida, East Coast city. Most famous winter resort in the world. Possession March 1 or by arrangement. Total property complete, \$900. Ten per cent cash, balance easy terms. Or will consider offers both properties separately. James Fuller, caretaker, West Palm Beach, Florida.

GOVERNMENT FARMS FREE—Official 112-page book "Vacant Government Lands" describes every acre in every county in U. S. How secured free. 1911 diagrams and tables. All about irrigated farms. Price 25c postpaid. Webb Pub. Co., Dept. 385, St. Paul, Minn.

BUY A VIRGIN FARM in Louisiana. Our farms are rich, high land. Won't need fertilizer for ten years. \$25 per acre, any size farm. Railroad through property, nearby markets. Long time payments. For particulars, write Genesee Lumber Co., box 105, Genesee, La.

FINE FARMING OPPORTUNITY in Louisiana. 60 miles from New Orleans on I. C. R. R. Temperate climate, good markets, splendid stock country with natural forage. \$20 per acre. Terms reasonable. Address, C. H. McNie, Kentwood, La.

PASADENA APARTMENT house for sale, \$15,000. Income \$200.00 per month. Next lot, vacant, worth \$3,500.00. Crocker, Abbott & Co., Pasadena, Cal.

"INNABAR MINES for sale by locator. Francis, Parkfield, Calif.

SACRIFICE—5-acre farm, city limits, \$5 monthly, \$300. J. Topping, Muskegon, Mich.

TO SELL YOUR PROPERTY write Northwestern Business Agency, Minneapolis.

A NUMBER of choice properties in California. Write for particulars to J. H. Behrens, Box 1304, Fresno, California.

FARM FOR PROFIT in Eastern North Carolina. The "Nation's Garden Spot." Leads other localities for vegetables, fruits and staple farming on small capital. Homeseekers and investors write Carolina Trucking Development Co., 812 Southern Bldg., Wilmington, N. C.

TRICKS, MAGICAL APPARATUS AND SUPPLIES—Amateurs supplied as well as the Great Professionals. Easy, interesting and entertaining. Amuse and astonish your friends. Large illustrated catalogue of clever tricks for the pocket, parlor and stage, price ten cents. Buy from real Magic Dealers. Send now. Read & Covert, 821 East 43d St., Chicago, Ill.

EIGHT games for 10c; chess, checkers, fox and geese, nine men Morris, authors, introduction game, Spanish prison, dominoes; a whole year's amusement. Send 10c today and get all eight games. St. Louis Specialty Co., Dept. F, 2028 N. Jefferson av.

FOR 10 CENTS we send 200 Magic Tricks with coins, cards, etc. You can do them at once. Be a Wizard, amuse friends and make money. Bates Magic Company, Dept. X, Melrose, Mass.

THE AERO SHUFFLE BOARD—More fun than a picnic. Send 50c and I will mail you this fine scientific game postpaid. Agents wanted. P. J. McKinley, 415 1st St., Brooklyn, N. Y.

MAGIC AEROPLANE TRICK, 10c. Catalogue included. Bailey, Box 212, St. Paul, Minn.

15" DANCING SKELETON ILLUSION, 10c.; 250 Magic Tricks, 10c.; 8 National Games, 10c.; Pack Magic Trick Cards, 10c.; Learn Magic, big book, 10c. Fun Cards, pack of 25, 10c. Catalog included. Bunch Co., Marshall, Missouri.

8 BIG FAMILY GAMES, 10c. Globe Novelty Co., Leavenworth St., Omaha, Neb.

MAGIC-SKULL, shines in dark, 10 cents. Klein, 1193 Broadway, New York.

100 TRICKS, with directions, fifteen cents. Bamberg, 1193 Broadway, New York.

LEARN TO THROW YOUR VOICE! Be a ventriloquist in a few hours. Clean, highclass, intensely interesting amusement. Anyone may learn. Small cost. New natural method never explained before. Protected by copyright. Send stamp for interesting booklet. W. M. Bailey, Lock Box 212, St. Paul, Minn.

PLAYS, VAUDEVILLE Sketches, Monologues, Dialogues, Speakers, Minstrel Material, Jokes, Recitations, Tableaux, Drills, Musical Pieces, Entertainments for all occasions. Make-up Goods. Large catalog free. T. S. Denison & Co., Dept. 11, Chicago.

YOU CAN BE A MAGICIAN; travel; give shows; make money. I tell how. Send stamp. Prof. Rapp, Box F-1115, Madison, Wis.

NEW AND NOVEL JOKES—Great fun producers. So simple a child can operate them. 1. The Split Jam (Look what you've done to the table cloth!!!). 2. Red Hot Cinder (Drop it on the rug or floor in front of fireplace). 3. Damaged Finger (Deceptive blood-soaked bandage. Great sympathy is expressed by your friends). 4. Blot of Ink (The Bookkeeper goes mad. Mother is frantic). 5. Luminous Pencil (a friend asks for a light, when you instantly hand him this pencil. Upon his assertion that it was a light he requested, not a pencil, you withdraw the protector from end of pencil and hand him a lighted match). Price 10 cents each, postpaid. Address Popular Mechanics Book Dept., 318 W. Washington St., Chicago.

RARE COINS AND STAMPS

\$7.75 PAID FOR RARE DATE 1853 Quarters, \$20.00 for a Half-Dollar. We pay a cash premium on hundreds of coins. Keep all money coined before 1880, and send 10 cents at once for our New Illustrated Coin Value Book; size 4x7. It may mean your fortune. C. F. Clarke Co., Coin Dealers, Dept. 14, Le Roy, N. Y.

COINS—Selling list of rare gold, silver, copper coins, fractional currency, bills, etc., free for stamp. John A. Lewis, 253 No. Washtenaw Ave., Chicago, Ill.

100 DIFFERENT GOOD UNITED STATES STAMPS, 25c. Catalogue free. Collins, 285 Orleans, Detroit, Michigan.

500 MIXED STAMPS FREE to buyers requesting approvals and sending 2c postage. Herbert Kelgwin, 52 Jones St., Jersey City, N. J.

COINS—20 DIFFERENT foreign 25c. 5 Confederate state bills, 15c. 100 different stamps, 2c. F. L. Toupal Co., Chicago Heights, Ill.

25 VARIETY FOREIGN STAMPS, 5 cents. 1000 mixed, 25 cents. Approvals. References required. W. L. Barrows, Box 12, Hartford, Conn.

20 DIFFERENT AUSTRALIA, 6 Barbados, 8 Bulgaria, 20 Japan, all for 15 cents. Popular Stamp Co., Box 840, Wallingford, Conn.

FREE STAMPS—3 different Soudan (Camel), or 5 different Costa Rica, or 5 different Tunis, stamp lists, lists of free premium stamps, etc., for 2c postage. Fine 50% approvals. W. C. Phillips & Co., Glastonbury, Conn.

STAMPS 100 ALL DIFFERENT, FREE. Postage 2c. Mention paper. Quaker Stamp Co., Toledo, Ohio.

STAMPS—105 China, etc., stamp dictionary and list, 2c. Bullard, Sta. A., Boston.

FOR THE HOME

FOR MECHANICS' WIVES, CHOP SUEY—How to cook it. Secret revealed for the first time. Tells you how to obtain supplies, real sauces, etc. How to prepare ingredients before cooking and how to cook it. All told in the plainest English and the professional's methods. Written by an American born Chinese, 8 years' experience in the Chop Suey business. Send ten cents and the entire secret will be sent postpaid. Henry Moy, Box 30, Gary, Ind.

FEELLESS AUTOMATIC DRAFT REGULATION, puts on draft while you sleep, insures warm house when you arise. Price, \$5. Write for circular B. Liberal discount to agents. O. E. Landis, 423 Charlotte St., Lancaster, Pa.

YOUR OLD CARPETS made into beautiful rugs; agents wanted. Springfield Rugg Co., Springfield, Ohio.

GOLD FISH—Canary—booklet free. Aquariums, cages, supplies. Pioneer Aquariums, Racine, Wis.

ATTACH THE VICTOR FURNACE TENDER to any heating system, dress in a properly warmed house. Now \$4 complete. Write for literature. V. E. Cozine, Gloversville, N. Y.

LADIES. Let us help do your washing. We make it so easy. Write for particulars. Compressed Air Washer Co., 85 N. High, Columbus, Ohio.

BEAUTIFUL ARTS-CRAFTS LAMPS—Anyone can make them out of paper, cardboard and wood. 16 designs. Inexpensive yet artistic. Complete book of instructions. Price 50c postpaid. Popular Mechanics Book Dept., Chicago.

MAKE YOUR OWN MISSION FURNITURE at the minimum of expense. Our 2 books "Mission Furniture, How to Make It." Parts 1 and 2, tell in plain, simple language just how to make 50 different pieces. Full dimensioned working drawings and half tones of finished articles. Price 50 cents each or \$1.00 for the two volumes, postpaid. Popular Mechanics Book Dept., Chicago.

METAL WORK AND ETCHING—A 96-page handbook for art metal workers telling how to make a great variety of useful and ornamental objects such as desk sets, arts-crafts jewelry, etc. Price, 50c postpaid. Popular Mechanics Book Dept., Chicago.

FOR MEN

MEN BUY YOUR HOSE DIRECT and save one half by sending \$1 for 6 pairs postpaid. Superior "Linenweave" Hose, linen heels and toes, as dressy as silk. Black, tan, navy, slate and grey, all sizes. State size and color. Handsome Christmas Gift. Satisfaction or money back. Windsor Specialty Co., 123 West Windsor St., Reading, Pa.

FOR MEN—The L. & N. BELT is not only a summer necessity—but an all year round comfort. Invisible, natural fitting, non-slippping and durable. \$1 post-paid. Send for circular. L. & N. Belt Co., 1257 N. Clark St., Chicago, Ill.

EXTRA HOLLOW GROUND. Swedish steel razor, 95c. Every razor guaranteed. Special offer to agents. Write today. Cutlery Supply Co., 519 American Trust Bldg., Cleveland, O.

DON'T SHIVER IN THE MORNING. Dress in a nice warm house, now for only \$4. Ask us how? V. E. Cozine, Gloversville, N. Y.

TWO SAFETY RAZOR BLADES resharpened free, enclose return postage. Detroit Cutlery Co., 31 Monroe, Detroit, Mich.

SAFETY RAZOR BLADES sterilized and sharpened better than new; 2 cents each. Five years' success. Send for blade box and circular. Electro Stropping Co., 134 Shelby St., Detroit, Mich.

MUSIC

ANY SHEET MUSIC of the popular kind, no matter where published, we will supply at 15c a copy postpaid. Classical Standard and Comic Opera numbers, 25c a copy. Willis Woodward & Co., 1193 Broadway, New York.

25 CENT SHEET MUSIC at 5c cents a copy post paid. Vocal and Instrumental. Choice of Anvil Chorus, Cavalleria Rusticana, Il Trovatore, Rosary, Palms, Jerusalem, and three hundred others. Our Big Book and Music Money saving catalogue mailed free. Write today. Chicago Book and Music Co., 5311 Monroe Ave., Chicago, Ill.

IF YOU WANT the latest music and a better assortment for less money than elsewhere, write today for catalog. Semple's Music House, 204 West Ave., Norwalk, Conn.

MUSIC—Send \$1 and receive two folios containing the music to Silver Bell, On Mobile Bay, and fifty other late and popular pieces. Latest catalogue included with order. Geo. Chapman, 3227 Beach Ave., Chicago, Ill.

"MEMORIES"—Latest Song Hit. Everybody singing it. Send 15c to Goldenburg Music Pub. Co., 7th & Elm, Cincinnati, O.

COMPOSERS—SONG-WRITERS: Want your music published? Free prospectus. Wrightsman, 120 Bryant Street, Washington, D. C.

"RULES FOR YOUNG MUSICIANS." A little booklet sent postpaid for 12 cents. Address Francis Publishing Co., Revere, Mass., Dept. C.

PIANOS AND MUSICAL INSTRUMENTS

BUESCHER TRUE-TONE CORNET. Practically new. W. W. Little, Early, Iowa.

STRADIVARIUS VIOLIN for sale cheap. Excellent sweet tone. Miss Bertha Mardes, Route 5, Rosedale, Kansas.

PRINTING

JUST OUT:—Over 2,300 names, heads of Rural Families of Coshocton County, Ohio. 25c per hundred or \$5 for complete list. Names and addresses bona-fide. William Coffman & Son, Warsaw, Ohio.

GUMMED LABELS—3,000, \$1. Catalogue free. Mac Taggart, Phila., Pa.

FOR \$2.90 WILL PRINT to your order 500 envelopes and 500 letter heads. Material and work first class. Samples free. Pearl Printing House, Palestine, Ill.

COMPLETE new printing outfit, \$25. Bargain. Box 431, Starke, Fla.

WE PRINT ANYTHING at Rock Bottom Prices. Stamp brings samples and price list. Eastern Printing Company, 1506 Eastern Avenue, Baltimore, Md.

PRINTING—100 NOTEHEADS, 100 Envelopes and 100 Cards neatly printed to your order; prepaid, \$1. Samples for stamp. Union Pub. Co., Dept. M, Uniondale, Ind.

1000 3½x6 CIRCULARS, book paper; postpaid, \$1. Smith Supply, Waukegan, Ill.

100 ENGRAVED STYLE Visiting Cards, 25c. 100 Neat Business Cards or Envelopes, 40c. Ketter, Box 142-P, Tippecanoe City, Ohio.

ALL FOR 50c—25 envelopes, 25 letterheads, 25 cards, postpaid, to introduce quality printing. Frost, Fargo, Okla.

PRINTING OUTFITS \$9.50 up. Printers' supplies. Bargain list 1c. Popular Bargains, Richland, Pa.

PRINTING PRESSES, Type and Supplies. Instruction book and catalogue free. L. M. Carroll & Co., 167 W. Washington St., Chicago.

TYPEWRITERS

GENUINE TYPEWRITER BARGAINS, no matter what make, will quote you lowest prices and easiest terms. Write for big bargain list and catalogue 17. L. J. Peabody, 278 Devonshire St., Boston.

REMINGTON TYPEWRITER \$12. Calligraphs \$6. Hammonds, Yest, Denismores, \$10. Smith Premiers and Jewetta, \$15. Oliviers, Underwoods, L. C. Smith and Royals, \$25. Fifteen days' free trial and one year's guarantee; don't purchase until you get our prices. Harlem Typewriter Exchange, Dept. P. M., No. 217 West 125th St., New York City.

TYPEWRITER RIBBONS for any make of machine, four for \$1. Carbon paper \$1 per hundred. Guaranteed. Peerless Ribbon Co., 217 West 125th St., N. Y. City.

STENOGRAPHER must sell her Remington typewriter, \$9. Miss King, 2230 7th Ave., N. Y. City.

5 REMINGTON TYPEWRITERS, good condition, \$12 each. One Smith Premier, \$15. Segerstrom, 200 Sykes Bldg., Minneapolis.

WRITE FOR BARGAIN LIST Guaranteed Typewriters. Free Trial. Whitehead, 186 N. La Salle, Chicago.

REMINGTON No. 6, new condition, \$15. Miss Wagner, 350 Elm St., Arlington, N. J.

I WANT TO CORRESPOND with persons who are about to buy a high-grade typewriter, and object to paying the high prices generally asked by manufacturers and dealers. Any make on approval. Catalogue, bargain list and valuable information sent free. A. E. Atchison, 4127 West 21st St., Chicago.

TYPEWRITERS—Every kind on the market, write today for best bargain you ever secured. Shipped anywhere on approval. \$10 up. Fletcher Typewriter Co., 205 N. 7th St., St. Louis, Mo.

OLIVER VISIBLE TYPEWRITER cheap. Charles Rickhart, Route 5, Rosedale, Kansas.

TELEGRAPHY

TELEGRAPHY—MORSE AND WIRELESS—Railway Accounting (Station Agency) taught quickly. R. R. Dispatchers and Western Union Wires and complete Wireless Station in school. Splendid opportunities—graduates assisted. Living expenses low—may be earned. Largest and oldest school—established 37 years. Investment \$25,000.00. Correspondence courses also. Catalogue free. Lodge's Telegraph & Railway Institute, 15th St., Valparaiso, Ind.

TELEGRAPHY TAUGHT in the shortest possible time. The Omigraph Automatic Transmitter combined with standard key and sounder. Sends you telegraph messages at any speed just as an expert operator would. Five styles. \$2 up; circular free. Omigraph Mfg. Co., 41 G. Cortlandt St., New York.

WIRELESS

A NUMBER OF HIGH CLASS induction coils, 6" spark gap upwards, for sale at reduced price. State your requirements in regard to spark gap and we will quote you lowest price. We should be pleased to receive inquiries for condenser of which we have large quantity in stock. Meyrowitz, 104 E. 23d St., New York City.

MAKE YOUR OWN WIRELESS APPARATUS. We furnish working drawings for Silicon, Vertical Perikon, Carborundum Detectors, Helix, Single or Double Slide Tuners, 15c each; Inductive Tuner, 30c; Rotary Spark Cap, 25c. Send postal money order. Stamps refused. No catalogs. Junior Wireless Co., 1786 Brooklyn Ave., Brooklyn, N. Y.

LEARN WIRELESS TELEGRAPHY. Keep up with the times. Here is your opportunity. For particulars, address Kenosha Wireless School, Kenosha, Wis.

WIRELESS OPERATORS—Our new wireless catalogue just out. Send 2c stamp for same, no postals answered. The I. W. T. Wireless Co. 1038a Broadway, Brooklyn, N. Y.

ELECTRICAL

STORAGE BATTERIES. Can supply 15 battery grids 6"x 4¼"x3/16" thick, connectors, rubber jars, filling caps, separators, and sealing compound to make a 6V. 60 A. H. battery equal to any on the market, with full instructions how to paste, form, and charge for \$4.10. Send P. O. or Express order. E. J. Van Stokel, 742 Webster Ave., Chicago.

STAGE ELECTRICIANS IN DEMAND. Positions open at big salaries. 5 sample lessons, 10c. Complete book: "How to Become a Stage Electrician," postpaid, \$1.00. Write today. Theatre "M," 438 Broadway, Denver, Colorado.

FOR SALE. Brass tubing, 1 inch 18 B, W. G., 50 lbs. Suitable for electric portables, gas fixtures, 10c pound. Frasse, Box 801, Brooklyn, N. Y.

VOLTMETER, AMMETER, Prints and instructions, 15c each. Semco, Gen. Del., Sta. A., Grand Rapids, Mich.

STORAGE BATTERIES, all sizes, 6-140, at \$20. Particulars for stamp. Hart, Box 280, Quincy, Ill.

FOR SALE—Ozone machine transformer, 40,000 volts, 4 amperes; cost, \$300; price, \$150. F. W. Bacon, Tiffin, O.

FORMULAS

USERS OF GASOLINE should send for my fire extinguishing formula. Will extinguish fire instantly. Formula, 25 cents. Ezra Stiedinger, Fairbury, Ill.

THREE FINE NEW FORMULAS for transferring photos to watch cases, chinaware, sofa pillows, etc., only 25c. Real Money Makers. P. Benson, Stewartville, Minn.

MAKE GOOD PAINT for 1c Per Pound. Directions. Three Dimes. Frost, Fargo, Okla.

MANUFACTURE CHEWING GUM. Complete Formula, 50c. C. Curtis, Station D, Columbus, Ohio.

GILDING WITHOUT A BATTERY—Valuable formula for only \$1. H. Travers, 504 Medaife St., Ottawa, Can.

"SNEEZE" POWDER FORMULA, 25c. Make Money. Box 102, Norwich, N. Y.

SILVERING MIRROR FORMULA and 40 other formulas, 10c. Digest, Grand Rapids, Mich.

DIAMONDS, AMETHYSTS, BERYLS, EMERALDS, rubies, sapphires, agates or topaz; formulas for manufacturing these. All are absolutely guaranteed. Price, each, \$1; or all for \$7. Your money refunded if not satisfactory. General Information Bureau, Madison, Wis.

MANUFACTURER of the finest Metal Polish on the market; will sell few copies of formula; correspondence solicited. J. F. Gorman, 2231 First Ave. South, Seattle, Washington.

SEND \$2 FOR THE GREATEST FORMULA of the age, Marble and Onyx produced on all metals. Samuel S. Kinney, 1776 E. State St., Trenton, N. J.

PUTZ POMADE METAL POLISH—Send Thirty-five cents for complete formula, and sell your engineer friends. Ask them—they know what it is. St. Louis Specialty Co., Title Guaranty Bldg., St. Louis, Mo.

350 MONEY-MAKING FORMULAS, 15c. A. H. Smith, 415 Ft. Dearborn Building, Chicago.

FOR 25c I WILL SEND you my book of formulas. It's a winner. Conley, Norwalk, Conn.

FORMULAS for anything, 25 cents each. Box 653, Kansas City, Mo.

350 MONEY-MAKING FORMULAS, 15c. A. H. Smith, 415 Ft. Dearborn Building, Chicago.

500 SECRET FORMULAS, 25c. Globe Co., E1712 Leavenworth, Omaha, Neb.

MISCELLANEOUS

A CARPENTER with The New Parkhill Pitch Gauge—on a square—can mark roof-framing quicker than the best expert can—without it. That's definite. Complete roof for any pitch—of hundreds—in 5 minutes. Any hip in 7 seconds. Steel nicked. Unequaled for a stair gauge. Sent prepaid for \$1.50. Money returned if Gauge is. John Parkhill, Rochester, Minnesota.

BRICKLAYERS LEVEL FREE—Bricklayers and Masons everywhere should write for our Free Proposition. You'll never regret it. General Products Co., Seneca Falls, N. Y.

STUDENTS IDEAL DRAWING TABLE, 31x48 inches; can be instantly adjusted for standing or sitting, and tilted any desired angle. Price, \$5. Invented and manufactured by Clayton Dean, Rockefeller, Ill.

MOVING PICTURE ARC Transformers cut light bills in two. Blueprints, full instructions, how to make one, 50 cents, postpaid. Stanley Curtis, Pope Bldg., Boston, Mass.

CHEMICAL ANALYSES, ASSAYS, MICROSCOPICAL TESTS. Investigations and advice in all chemical questions. 22 years' experience. Parohk Chemical Laboratory, Trenton, New Jersey.

LOOK—BEAUTIFUL VIEW of N. Y. City and money making information for 3 penny stamps. Ben Levy, Dept. AB, 47-49 Maiden Lane, N. Y.

RAINCOATS—RUBBERIZED "SLIP-ON"—for men and women. Perfect fitting, plaid lining, sewed seams, convertible storm collar, adjustable wrist shields, two side pockets. Rubberized cloth sheds water like a duck. Sizes, 32 to 46. Price, delivered, \$3.98 each. Novelty Rubber Co., Williamsport, Pa.

SAVE 13% ON YOUR CUTLERY. Write us for Free Profit Sharing Coupon and Catalog. Best Goods you ever saw for your money. General Products Co., Seneca Falls, N. Y.

ADD AND SUBTRACT FRACTIONS faster than you can think and with absolute accuracy. You can do it with my extremely simple and convenient fraction adder. Price, 10 cents. E. J. Lawrence, Box 422, New Britain, Conn.

METALIZED FLOWERS, Insects, etc., for jewelry. Pleasant, profitable employment. Send stamp for free sample and booklet. P. Benson, Stewartville, Minn.

ONE DOLLAR WILL BRING YOU the whole secret of making ice creams, in a book, also receipts for 60 different flavors, satisfaction guaranteed. R. F. Pratt, Box 470, Haverhill, Mass.

100 MONEY MAKING FORMULAS, etc., published monthly. Worth dollars. 6 months, 10c. Sample copy, 2c. Digest, Grand Rapids, Mich.

STEEL STAMPS, Initial stamps, 10 cents per letter. Joe Mansold, 76 W. Crozier St., Akron, Ohio.

"THE AD WRITERS' ASSISTANT"—Book containing 350 phrases, headlines, suggestions, interesting opening chapters, each illustrated with appropriate cut, mailed, 25 cents. Cuts supplied. F. S. Alles, Drexel Building, Philadelphia, Pa.

I MADE \$18,000.00 in Three Years in mail-order business; free booklet tells how. H. System, Marion, Ky.

READ "THE MAIL ORDER MERCHANT," a monthly "mum-maker." Six months subscription, 17c. H. Latz, Atlantic City, N. J.

CARDS LOCATED by Spelling, 25c. Wm. Lee, Three Lakes, Washington.

200 FORMULAS and Digest publishing 100 formulas monthly. one year, 25c. Digest, Grand Rapids, Mich.

RUBBER STAMPS, best and cheapest. Catalogue free. O. J. Jones, Manteo, N. C.

CARPENTERS, send 25c coin and I will tell you how to plane any crossgrained wood perfectly smooth with a common plane. J. Trafton, 7709 14th Ave., N. W., Seattle, Wash.

KASHOO SNEEZING POWDER. Sample bottle, 10c. Box 102, Norwich, N. Y.

ADVERTISEMENTS placed in over 100 magazines, 3c word. Zerith Agency, Station N., Cincinnati.

READ OUR ADVERTISEMENT under agents wanted, Pinless Clothes Line Co.

CIRCULARS MAILED honestly for 15c a 100. H. Latz, Atlantic City, N. J.

WE FURNISH SUGGESTIONS to moderate investors—not speculators. State occupation and amount you can put to safe and profitable use. Address Geo. H. Heafford & Co., Fisher Building, Chicago, Ill. References.

WRITE SECRETLY with Invisible Ink; bottle 10c coin. W. H. Luecht, 2035 Wilmet Ave., Chicago.

\$5 MIRROR SILVERING, white metal plating and zinc cut process. Explicit directions, all for \$1. W. Andersch, 423 East 158th Street, New York.

HECTOGRAPH HOME MADE. Cost trifling. Instructions, 25c. Valuable formula book free with order. Barstow Company, 314-23rd St., Oakland, Calif.

HANDCUFFS, LEGIRONS, NIPPERS, etc., repairs, keys, handcuffs, \$2.50 pair up. Frank Widmayer, 2312 Broadway, New York City.

THIRTY DOLLARS gives you a new list of ten thousand leading farmers. Rijs for any mail order proposition. Depend on Letter Service, 222 N. State St., Chicago.

SEND ME SEVEN DOLLARS for New Elgin Watch, Twenty Year Case. Make dandy Xmas present. C. G. Purdom, Louisville, Ky.

BROTHERS, I CAN SHOW you how to burn 25% less coal and get more heat, only 25c. Osborn, Box 36, Washington, N. J.

TOBACCO-CURE. One box cures. Guaranteed or money back. Established 1894. Write for special offer. Allen Distributing Co., 319 Altman Bldg., Kansas City, Mo.

PYRMA ALUMINUM MATTING—Best covering in the world for automobile running boards and floor boards, motor boat floors, etc. Send for samples and particulars. Metallic Automobile Matting Co., 300 Mill St., Rochester, N. Y.

YOUR AD in nearly fifty Magazines, 3 months, 5c per word. A. S. Mankin & Co., Alexandria, Va.

EMBOSS YOUR OWN STATIONERY with initial, monogram, or name and address. My nicked steel-die embosser, a high class useful irresistible novelty does perfect work. An elegant Christmas gift. Nothing like it for the price. Send stamp for specimen sheets and my liberal offer. Harry L. Miller, Embosser, Marietta, Georgia.

TRICKS, JOKERS, PUZZLES, ILLUSIONS, Novelties—Magic Pocket Trick Free. Illustrated Catalog included. Send 6c stamps. Magic Dept., 10-270 West 39th St., New York.

SEE WHAT WE SAY under "Patent" heading. Swift, Attorney, Washington.

GINSENG, \$35,000 per acre. Send 10c for my "Ginseng Culture," giving full information, prices of roots and seeds for planting. W. N. Long, Florence, Ky.

MOTION PICTURE MACHINES, Film Views, Magic Lanterns, Slides and similar Wonders For Sale. Catalogue Free. We also Buy Magic Machines, Films, Slides, etc. Harbach & Co., 809 Filbert St., Philadelphia, Pa.

I WILL START YOU earning \$4 daily at home in spare time, silvering mirrors; no capital; send for free instruction booklet, giving plans of operation. G. F. Redmond, Dept. 306, Boston, Mass.

PATENTS SECURED—C. L. Parker, ex-examiner Patent Office, 910 G St., Washington, D. C.

BROTHER—Accidentally discovered root will cure tobacco habit. Gladly send particulars. F. Stokes, Mohawk, Florida.

TOO LATE TO CLASSIFY

WRITE US FOR ANY KIND of a sign, letters and figures. Enclose 4c in stamps for our (P. M.) Catalogue, etc. Albright Sign Co., Inc., Muncie, Ind.



ELECTRICIAN'S WATCH—NON-MAGNETIC

Send now for my non-magnetic watch, only \$5.00 (delivered). This watch will positively withstand all magnetic attractions. Tested to 2000 volts, absolutely guaranteed to keep the most accurate time under all conditions. Approved by everybody in the Electrical Industry. Stem wind and set; dust proof; thin model. E. KIRCHBERG, 132 No. State St. (Old No. 76) CHICAGO

Matchless Pocket Lighter

Durable and waterproof, with perfect ignition. Satisfaction guaranteed or money refunded. Sent post-paid, complete with pocket clip, 35c. Special proposition to agents and dealers. A perfect lighter. Occupies no more space in the pocket than a pencil. Indispensable to every smoker, hunter, fisherman, and automobilist. Heavily nickel plated and made of finest material.

SCHILLER MFG. CO., Dept. M4, Schiller Building, Chicago

Let Me Show You How to Earn \$3,000 to \$10,000 a Year in the Real Estate Business



J. H. JOICE, President

NO CAPITAL NECESSARY

If you are ambitious to better your condition—if you want to establish yourself in a splendid paying business requiring no capital—send me your name and address and I will mail you—*free*—a valuable *62-page prospectus* explaining our system of money-making, without interfering with your present occupation. We have perfected a thoroughly practical scientific method of teaching by mail the

Real Estate, Brokerage and Insurance Business

Under our plan, we teach these big money-making branches. When you are thoroughly qualified to make a success of the business, we appoint you

Special Representative

This gives you a chance to identify yourself with the oldest and largest Co-operative Real Estate and Brokerage Company in America. By our system you can—if you will—be making money in a few weeks without conflicting in any way with your regular work. Our Co-operative Department will give you more choice, salable property to handle than any other concern in the world. So the sooner you investigate our plan, the sooner you will get your name on your own real estate signs and be ready for business.

Valuable Commercial Law Course Free

To each of our representatives we also give a thorough course in commercial law without cost. The instruction is indispensable to any man who wants to make his way in the business world. We teach you, free, everything you need to know to successfully meet legal problems that may arise in any business transaction. And we also furnish you free legal advice whenever you require it.

Send For This Book Now

Our Big 62-Page Free Prospectus will prove of great interest and real value to anyone, but it is of vital importance to office employees, salesmen, agents, clerks, solicitors and others who are ambitious to enter the realm of better things in business. This book is an inspiration to the indifferent, a spur to the laggard, and a stimulus to the ambitious. It deals with the great problems of business, and points the only sure way to the complete mastery of Real Estate, Brokerage and Insurance, three of the most profitable branches of modern business, which have made many millionaires and brought great prosperity to tens of thousands of active, energetic men all over the land.

MAIL THE COUPON TODAY

Don't procrastinate. Act! Anything that is worth doing is worth doing promptly. Resolve to send for this *big free prospectus*, and send for it *right now*, while the matter is before you. "I'll do it tomorrow" has been the grave of countless good intentions. "I'll do it today" is the solid rock on which to build the only enduring success.

Just clip the coupon, fill it out, sign and send today. By return mail you will receive *free* the invaluable book, which to thousands of ambitious men has proved the key that opens the door of great achievements in business.

INTERNATIONAL REALTY CORPORATION,

2036 Manhattan Building, Chicago



COUPON

The International Realty Corporation,

2036 Manhattan Building, Chicago

Please send me, by return mail, your big 62-page Free Prospectus and oblige.

Name

Address



THIS FOB GIVEN AWAY

To advertise **The Collette School of Engraving**, this beautiful Roman Gold Finished Fob, on Pure Grosgrain Silk (your own initial), will be sent at cost of piercing and engraving the letter.

This FOB is six inches long, suitable for either man or woman.

Guaranteed to be exactly as represented. Just the FOB every young man would like to have. Makes a suitable and inexpensive Christmas present.

State the initial wanted, and send **38 CENTS** by Postoffice Money Order or Coin or Stamps, to help pay cost of piercing and engraving. **Cannot be purchased in any jewelry store for less than \$1.00.**

FOB will be sent, postpaid, with information, telling how you can easily and quickly learn the art of engraving.

**THE COLLETTE
SCHOOL OF ENGRAVING**
37-39 Maiden Lane, New York

HOW YOU CAN GET An Automobile FREE

We want honest, sober young men in every county to learn at home to repair, run, and to teach others, and then sell the **COEY "FLYER,"** a 6 cylinder, 50 H. P., 5 passenger Automobile — "The World's Best Value." Write for full particulars how you can get one free — address:

**C. A. COEY'S
SCHOOL OF MOTORING**
Dept. 20, 1424-26 Michigan Ave.
CHICAGO, ILL.



ADVICE

Information and counsel on any subject under the sun. No matter what you want to know, no matter what your present condition, our big organization can help you.

WRITE TODAY FOR BEAUTIFULLY ILLUSTRATED BOOK FREE
NATIONAL BUREAU OF ADVICE AND EDUCATION, 527 Ashland Block, CHICAGO

BE AN ELECTRIC METERMAN

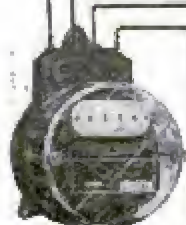
The rapid introduction of electricity is creating hundreds of new positions each year. Instruments and Meters are used wherever Electricity is used. Trained men must be had to maintain these Instruments and Meters.

Metermen Earn \$900-\$1800 a Year

Our course will qualify you for a position as Meterman. Practical—easy to learn—recommended by leading electrical men.

Write to-day for FREE booklet—tells all about this new work, and how we assist our graduates.

**Fort Wayne
Correspondence School**
1011 Shoaff Bldg., Ft. Wayne, Ind.



Highland Park College

Des Moines, Iowa



Enter
Any
Time

2000
Students
Annually

Special terms
open
November 28,
January 2.

Students, however, may enter any time they are ready to come

One of the most completely equipped **ENGINEERING SCHOOLS** in the country

COURSES OFFERED

1. CIVIL, ELECTRICAL AND MECHANICAL ENGINEERING COURSES. Standard courses are offered in Civil, Electrical and Mechanical Engineering. Special opportunity is offered for making up work or for taking a complete course preparatory to the standard Engineering Courses. Shop work from the beginning comes in preparatory courses. See our new Engineering Catalogue.

- 2. SHORT COURSES**
- 1. One Year Electrical Engineering Course
 - 2. One Year Telephone Engineering Course
 - 3. One Year Steam Engineering Course
 - 4. One Year Machinists' and Automobile Course
 - 5. One Year Course in Mechanical Drawing

Just a fair common school education is all that is required for entrance to these courses. These courses are very practical and are intended for those who have but limited education and do not see their way clear to take a complete Engineering Course. The Machinists' Course is especially practical. The new machine shops are the most complete to be found in connection with any Engineering School in the United States.

SPECIAL COURSES

1. TRACTION ENGINEERING. This is the most complete course in Traction Engineering offered by any Engineering School in the country. It may be completed in three months. Students are taught how to make all repairs on engines as well as to handle them. Four traction engines used for experimental purposes.

2. GASOLINE AND AUTOMOBILE COURSES. These courses may be completed in three months. They are exceedingly practical. Complete Chauffeur practice. Just a fair common school education is all that is necessary to enter.

3. FARM BLACKSMITHING, FARM CARPENTRY.

Mention course in which you are interested. Address,

O. H. LONGWELL, Pres., Des Moines, Ia.



Have You Made Good?

Are you a business and social success or merely one of the submerged millions? You can be exactly what you will be! I have cashed the proof, why not you? Hundreds are applying Deductive Thought and my suggestions to their daily lives and are enjoying that buoyant health which makes cashable thought and action NATURAL. It will cost you nothing to write and learn the truth. My new booklet, "Success Through Deductive Thought," sent absolutely FREE. Address: **FRANK D. FOLLANSBEE, 7157 Yale Ave., Chicago**



IF YOU STAMMER

Attend no stammering school till you get my large FREE book and special rate. Largest and best school in the world curing by natural method. Write today. **Lee Wells Millard, Pres., North-Western School for Stammerers, Inc., 917 First St., Milwaukee, Wis.**



VENTRILOQUISM

LEARNED BY
ANY MAN
OR BOY
AT HOME
SMALL COST

Send today 2c stamp for particulars and proof.
O. A. SMITH, Room D 29, 823 Bigelow St., PEORIA, ILL.

WHEN YOU WANT ANYTHING AND DON'T KNOW
WHERE TO FIND IT—WRITE BUREAU OF
INFORMATION, POPULAR MECHANICS, CHICAGO

Two Excellent Books for Those Who
Like to Make Things

Amateur Mechanics Nos. 1 and 2

PRICE 25 CENTS EACH POSTPAID

Popular Mechanics Book Department 318 W. Washington St. CHICAGO



ECLIPSES THEM ALL



BRAND NEW—UP TO DATE—JUST OFF THE PRESS

The Theory and Practice of Every Phase of Electrical Communication is thoroughly covered

MODERN AMERICAN TELEPHONY

This book treats of present day telephony in all its branches in plain everyday understandable language. It will serve to make the rough places smooth and will solve problems for practical telephone men. It is alike indispensable to the expert telephone engineer, and to telephone workers in all departments.

Edited by **ARTHUR BESSEY SMITH, E. E.**, assisted by a large corps of Telephone Experts whose reputation in their respective fields is international.

Positively down to the last minute. It has no rival

The very latest Automatic Systems, as well as Wireless Telephony is fully described. An elegant book of about 500 pages, it is beautifully bound in full dark blue seal leather, round corners, polished red edges, and has upward of 400 specially designed engravings and diagrams. Genuine gold leaf stampings, pocket size (postage paid to any address) **PRICE ONLY \$2.00**

Order Now On Approval The only way the practical merit of this book can be proven is by an examination of the book itself, which we will submit for examination, to be paid for or returned, after looking it over. Upon receipt of the following agreement, the book will be forwarded.

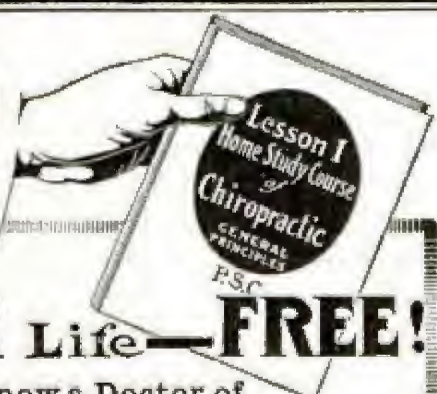
NO MONEY IN ADVANCE REQUIRED
FREDERICK J. DRAKE & CO.
1325 Michigan Ave., Chicago, Ill

Kindly mail me a copy of Modern American Telephony. If found satisfactory, I will immediately remit you \$2.00 or return the book to you.

NAME
OCCUPATION
ADDRESS P. M.

Lesson Number 1 FREE

YOUR Start in Life—FREE!



Many a man, now a Doctor of Chiropractic, earning \$5,000, yes \$10,000, even \$15,000 a year traces his start in life direct to this book, Lesson No. 1—They all paid for it—**YOU** get it **FREE**.

95% of the people around you are sick. More and more of them every day are learning of the wonderful results of Chiropractic—the science of common sense. No drugs! No surgeon's knife! The world wants Doctors of Chiropractic and stands ready to pay them handsomely. We now have on file urgent demands for Chiropractors from more than 1000 cities where certain incomes of \$5,000 to \$15,000 await competent graduates.

J. V. Markwell, a Leesville, La. Chiropractor recently wrote us: "\$840.50 is the exact amount I have taken in since opening my office, just seventeen business days." Tell us; where is there another profession where the financial returns are so great or so sure? Now, are you going to let a two-cent stamp stand between you and this chance to get your start in life at our expense? Stop right now—write for this free lesson.

PALMER SCHOOL OF CORRESPONDENCE
CHIROPRACTIC FOUNTAIN HEAD
DEPT. P. M. DAVENPORT, IA. U. S. A.



"HELP WANTED"
—Uncle Sam.

Railway Mail Clerks
Internal Revenue Employees
Custom House Examiners & Clerks
Examinations Everywhere Soon
Over 8000 Positions Will Be Filled
\$800.00 to \$1800.00 a Year
for LIFE

No "layoffs" without pay, because of strikes, financial flurries or the whims of some petty boss. Excellent opportunities for quick advancement to Higher Government Positions. If you want immediate appointment, send **TODAY** for our schedule showing locations and dates of the coming examinations. Any delay means the loss of just so much time in preparing yourself for examination.

We Prepare Candidates Free

The coupon, filled out as directed, entitles the reader to a free copy of our book, "Government Positions and How to Obtain Them," and to consideration for Free Coaching for the examination here checked.

SEND COUPON BELOW

FRANKLIN INSTITUTE

Dept. R 108, ROCHESTER, N. Y.

..... Railway Mail Clerk (\$800 to \$1400)	..... Customs Positions (\$800 to \$1500)
..... Postoffice Clerk (\$800 to \$1200)	..... Internal Revenue (\$700 to \$1800)
..... Postoffice Carrier (\$800 to \$1200)	..... Stenographer (\$800 to \$1500)
..... Rural Mail Carrier (\$500 to \$900)	..... Clerk in the Departments at Washington (\$800 to \$1500)
..... Bookkeeper (\$900 to \$1800)	

Name
Address R 108

Use this before you lose it. Write plainly.

MEN WANTED IN AUTO BUSINESS



Big demand for trained men. Chauffeurs, repairmen, demonstrators, salesmen, garage managers, and agents.

EARN BIG MONEY

Be an auto expert—learn all about automobiles; how to drive any car or truck; how to properly repair them. You can learn all in a few weeks in this great school.

By the "Sweeney System"

of practical automobile instruction—the most thorough, interesting course of auto training in the country, embracing every point worth knowing, including vulcanizing, brazing, oxy-acetylene welding, lathe work, machine shop practice and practical work on real cars in shops and on roads. No books used; tools given free.

FREE
ONE
WEEK'S
TUITION
COUPON
AND
CATALOG

Write for my illustrated catalog. Contains articles by well known auto men; tells all about the "Sweeney System" and the great opportunities for trained automobile men. I'll also send to all Popular Mechanics readers a tuition coupon good for one week's tuition absolutely free. Send for free catalog and coupon right now.
EMORY J. SWEENEY, Pres.

SWEENEY AUTO SCHOOL 1464 Woodland Ave.
KANSAS CITY, MO.

Experienced chauffeurs, repair men, truck drivers
and demonstrators furnished.

I WANT MEN



Like YOU, Who Want to Make
\$3,000 A Year, or More

We need a good, live man right now in your territory to handle real estate deals for us. No experience or capital necessary. We will teach you the Real Estate Business, then appoint you our representative in your locality. Easy work; large profits. Write for free book.

MORDEN LAND & LOAN CO.

406 Palace Bldg. MINNEAPOLIS, MINN.



ANYBODY CAN LEARN

to paint portraits by my practical system of personal instruction by mail. You can earn \$25 to \$50 a week as portrait artist. Write for free test lesson plate and booklet.
L. T. KUNDE, Dept. A, Cawker Bldg., MILWAUKEE, WIS.



WANTED—MEN

Prepare as Firemen, Brakemen, Electric Motormen, Train Porters (colored). Hundreds put to work—\$65 to \$150 a month. No experience necessary. 500 More Wanted. Enclose stamp for Application Blank and Book. State position.

INTERNATIONAL RAILWAY CORR. INSTITUTE
Dept. 35 Indianapolis, Indiana

LEARN WATCHMAKING AT HOME



You can learn by our modern and original system of instruction every part of the Watchmaker's Trade at home as good or better than at a shop. You can earn money while learning and secure a well paying position or start in business after completing our course of instruction. Good watchmakers are always in demand and earn from \$20 to \$35 per week. For particulars apply to the WISCONSIN SCHOOL OF WATCHMAKING, Strub Bldg., MILWAUKEE, WIS.

\$25 TO \$100 A WEEK
PAID TO OUR GRADUATE Chauffeurs and Auto Experts



Course Endorsed by Benj. J. Briscoe,
Pres. of the United States Motor Co.

We teach you at home in ten simple lessons to earn big money, and help you to get a fine job. Write for FREE prospectus, testimonials of graduates, and endorsements of ten leading auto makers. Small Payment Starts You. Money Back If Not Satisfied. Free model of auto to each student. Write us to-day—Now. **THE PRACTICAL AUTO SCHOOL**, 68 Beaver Street, New York.

Traveling Salesmen and Saleswomen Wanted

Earn While You Learn. We now have on file letters from thousands of Wholesale and Manufacturing firms who are anxious to employ Salesmen and Saleswomen capable of earning from \$1,000.00 to \$10,000.00 a year and expenses. No former experience needed to get one of these good positions. We will teach you to be a high grade Salesman or Saleswoman in eight weeks by mail and our **Free Employment Bureau** will assist you to secure a position where you can earn good wages while you are learning Practical Salesmanship. Write today for full particulars, list of good openings and testimonials from over a thousand persons we have recently placed in good positions.

Address, Nearest Office, Dept. 124

National Salesmen's Training Association
Chicago New York Kansas City New Orleans Seattle U.S.A.

WANTED Motion Picture Plays

Demand rapidly increasing; larger prices being paid. You can write them; we teach you in 10 easy lessons. Ours is the original and only thorough course; graduates selling their plays. Write now for full details. Address

ASS'D M. P. SCHOOLS, 701 Chicago Opera House Block, Chicago

FOR Our Six Lessons will teach you at home to become a good Penman. These lessons are copiously illustrated and have printed directions for practice and criticism of your work. Send 2 cent stamp for Trial Lesson. **SPALDING'S COM'G COLLEGE**, 928 Oak St., KANSAS CITY, MO.



WINDOW TRIMMING

Advertising and Card Writing are the best paid professions in the world. Interesting prospectus FREE tells you all about it. **KOESTER SCHOOL**, 306 Jackson Boulevard, CHICAGO



BE AN ENGRAVER

LEARN AT HOME—EARN \$25 to \$50 WEEKLY. We give personal instructions and furnish necessary tools FREE. Terms reasonable. Complete particulars by mail.

Chicago Engraving School, Dept. 20, 110 W. Chicago Ave., Chicago

MUSIC LESSONS FREE AT YOUR HOME

Write Today for our Booklet. It tells how to learn to play Piano, Organ, Violin, Mandolin, etc. Beginners or advanced pupils. **American School of Music, 50 Lakeside Bldg., Chicago, Ill.**

BE A DETECTIVE

Earn from **\$150.00 to \$300.00** per month; travel over the world. Write **C. T. LUDWIG, 1600 Searritt Bldg., Kansas City, Mo.**

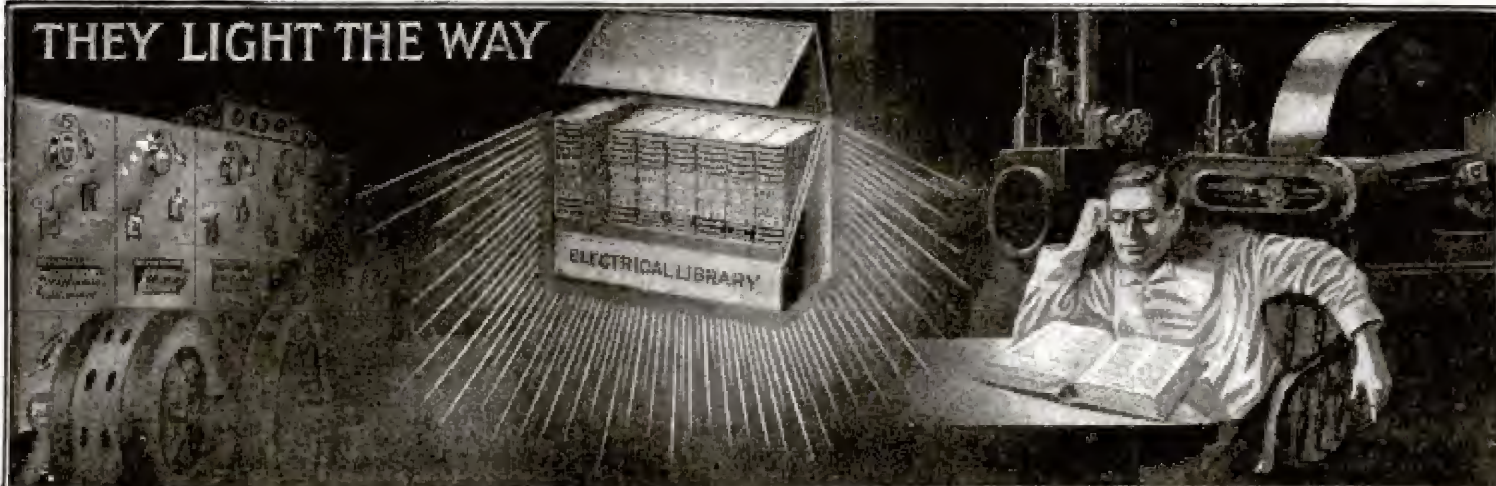
ARITHMETIC SELF-TAUGHT

A plain, easily-understood volume for all who have not had the opportunity of learning this subject thoroughly, or who have forgotten what they once learned. 257 Pages. Requires no teacher. This great little book sent postpaid for 60 CENTS. Stamps accepted, leather binding \$1.

GEO. A. ZELLER BOOK CO.
Est. 1870, 4462 W. Belle Place ST. LOUIS, MO.

**SPANGENBERG'S
PRACTICAL
ARITHMETIC
Self-Taught**

THEY LIGHT THE WAY



YOU Be The Judge of the VALUE to You of the Electrical Workers' Standard Library

Intelligent men expect a dollar of value for a dollar expended. Value must be based upon cost. Cost means more than dollars spent in production. The number of experts devoting years of painstaking research; the time spent in writing, drawing illustrations, editing, and revising; the many thousands of dollars expended from start to finish, until the books were ready for you, must all be counted when estimating value.

It is easy to see that the VALUE TO YOU of this set of wonderful books cannot be computed in dollars when cost is counted. But you shall be the judge.

In the quiet of your home, with no persuasive salesman to influence you, use YOUR OWN JUDGMENT in estimating the value of these books to you. We will send them at our expense for five days' examination—test the examples if you will—apply the knowledge in your everyday work, and then if you can honestly say they won't help you, return them at our expense and we won't say a word.

We are willing to abide by your decision since we know the great value of these Practical, Helpful, Handy and Elegant Books, and we have faith in your good judgment, and therefore believe you'll accept our REMARKABLY LOW PRICE and EASY TERMS, and agree with us you are getting value full measure and running over.

Don't Delay. Fill in Coupon and Mail Today

COUPON

National Institute of Practical Mechanics, P. M.

Without any obligation on my part to purchase, please send me particulars of your plans and prices of the Electrical Workers' Standard Library when furnished either with or without the privileges of your Institute.

Name.....

Address.....

Occupation.....

Employer.....

NATIONAL INSTITUTE OF PRACTICAL MECHANICS
1325 Michigan Avenue CHICAGO, U. S. A.

STAMMER

My book "How to Stop Stammering"—a treatise on "Scientific Talking"—direct to the point.

Write M. L. HATFIELD, 1462 Grove St., OAKLAND, CALIF.

I TEACH BY MAIL

WRITE FOR MY FREE BOOK "How to Become a Good Penman" and beautiful specimens. Your name elegantly written on a card if you enclose stamp. Write today. Address F. W. TAMBLYN, 418 Meyer Bldg., Kansas City, Mo.

Learn This Profession

We Teach You by Mail to Be a Doctor of Chiropractic and equip you to earn \$5,000 a year. Greatest demand for this treatment. Big practice from start assured. A profession that is not crowded. Easily and quickly learned at home with our lessons and charts. Write today for free book—"How to Learn Chiropractic," and full information as to special offer. NATIONAL SCHOOL OF CHIROPRACTIC, Wendell Bldg., 844 W. Madison St., Chicago, Ill.

LEARN

D

BY MAIL

Your earning capacity can be increased threefold by proper development. No matter what line you are in, whether you have had experience in drafting or not, our full and partial courses fit every need, in Drawing, Estimating, Plan-reading, Mechanical, Architectural and Structural Drafting and Design. Our graduates are much in demand.

DRAFTING

Students study and figure on blue-prints of buildings and machinery actually being constructed! Your work is approved by Chicago's leading architects and engineers. Low tuition, easy payments. Mention course and send for folder to-day.

Chicago Technical College,
660 Athenaeum Bldg., Chicago, Ill.

Courses in same subjects at our school in Chicago. Day and evening classes. Ask for catalog B.

Earn \$60 to \$100 a Month



OUR BOOK FREE

Men 20 to 40 Years Old Wanted at Once for Electric Railway Motormen and Conductors

Our mail course will prepare you for Motorman or Conductor in four to six weeks, and we will immediately assist you to a good paying position. You will be independent; your services will be in demand; good Motormen and Conductors are needed everywhere. We place men on city and interurban lines in all parts of the country, and want men in every state.

RIGHT NOW IS YOUR OPPORTUNITY!

Fill in the coupon, cut it out and send it at once for our Free Book, "Great Opportunities in Electric Railway Work."

NATIONAL RAILWAY TRAINING ASSOCIATION
Suite 7, Dwight Building Kansas City, Mo.

Name..... P.O..... State..... Age.....

Young Men Wanted

For AUTO Drivers AND Repairmen



Big demand for trained men everywhere. A new field—and constantly growing larger. Pleasant work, out-of-doors, and big pay.

You Can Be An Auto Expert

We teach you the entire subject by mail in 10 weeks. Simple, practical, and interesting home study in spare time. Anyone can learn now. No automobile necessary—we furnish free model. Besides, we assist you to secure a good position.

SEND FOR FREE LESSON TODAY

Don't miss this offer. Write us at once—before you forget.

The Original Auto School

EMPIRE AUTO INSTITUTE

735 Empire Bldg.
Rochester, N. Y.

Owners—We supply competent men.

**EARN
\$25.00
TO
\$50.00
Weekly**



COPY THIS SKETCH

and let me see what you can do with it. You can earn \$20.00 to \$125.00 or more per week, as illustrator or cartoonist. My practical system of personal individual lessons by mail will develop your talent. Fifteen years successful work for newspapers and magazines qualifies me to teach you. Send me your sketch of President Taft with 6c. in stamps and I will send you a test lesson plate, also collection of drawings showing possibilities for YOU.

THE LANDON SCHOOL OF ILLUSTRATING
1438 Schofield Building, Cleveland, Ohio. and CARTOONING

PIANO TUNING PAYS

You can learn at home by devoting your spare moments to the study of our correspondence system.

It is a profession that can be converted into money at any time or place in the civilized world at an hour's notice.



THE TUNE-A-PHONE IN USE

Our graduates earn \$5 to \$10 per day the year round.

We supply free a Tune-a-Phone, also a working model of a full-sized, Modern, Upright Action, and the necessary tools for each pupil.

Our wonderful invention, the Tune-a-Phone, gives the exact number of beats that should occur in the test intervals. With it the student knows what the result should be. It eliminates guess-work.

Write today for free illustrated descriptive booklet. Address,

NILES BRYANT SCHOOL of PIANO TUNING
14 Pine Arts Building, BATTLE CREEK, MICH. U.S.A.

Earn \$25⁰⁰ to \$75⁰⁰ Weekly Repairing Watches *We Teach you how.*

WE WILL HELP YOU START IN BUSINESS

This is not a correspondence school. It is a big watch repairing and jewelry concern. We give you actual practice. You can stay at home and continue your present occupation. You make money while you learn.

WE GIVE INSTRUCTIONS FREE BECAUSE WE WANT YOU TO REPRESENT US.

We mean just what we say. We will furnish you, free of cost, text books, clear, simple illustrated lessons and photo prints showing exactly how to do each job. **You will be surprised to see how easy and simple it is.** Our repair department will do the difficult jobs for you until you learn how—you take the profit.

IF YOU MEAN BUSINESS We Will Stand Back of You

We will back you to the limit. We will start you right. You will have the benefit of our advice, instruction and experience. We will supply you with materials at rock-bottom prices. Start now—as you will need only a few dollars for tools. You can make enough money repairing watches to open a place of your own in a few weeks.

Send us your name and address on a postal card, or write us, and we will send you illustrated explanation of Watch Repairing Business by return mail—quick.

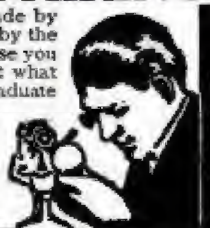
CHAS. F. ELMORE, Principal of Watchmaking College
Rogers, Thurman & Co., 101-119 N. Wabash Av., Chicago

LEARN WATCH REPAIRING

Be a watchmaker—you can learn this profitable trade by correspondence in a few weeks in your own home by the DeSelms Chart System. After you complete the course you will know a watch from A to Z. You will know just what the matter is and how to repair one. When you graduate you will be a practical watchmaker and repairer and competent to fill any position. Positions for our graduates.

Ask for our Free Book. It explains our system and terms.

THE DeSELMS WATCH SCHOOL
23 Perry Street ATTICA, INDIANA



LEARN WATCHMAKING

Engraving and Jewelry repairing. Earn while learning. Our school endorsed by leading jewelers. Positions secured for graduates. Send for Free catalogue.

CHICAGO SCHOOL OF WATCHMAKING
Dept. 20, Bush Temple CHICAGO

LEARN JEWELERS' ENGRAVING

A high salaried and easily learned trade, taught thoroughly by mail. We will teach the beginner better engraving than he can gain in years of rigid apprenticeship. We will also improve the skill of any engraver. Send for our catalog.

The Engraving School, 112 Page Bldg., Michigan Ave., Chicago, Ill.



LEARN WATCHMAKING

Watchmaking pays and you can earn while you learn. Write for FREE BOOK, "How to be a Watchmaker." Postal brings it.

Stone's School of Watchmaking
912 Globe Bldg. St. Paul, Minn.

LEARN PLUMBING

A trade that will make you independent for life. Hours Shorter—Pay Bigger—Demand Greater than most any trade. You need no previous experience. Our practical methods enable you in a few months to hold position as skilled plumber or conduct your own business. Catalog sent free.

St. Louis Trades School
4430 Olive St. ST. LOUIS, MO.

**BIG
PAY
SHORT
HOURS**

THE MECHANICS' HANDBOOK ELECTRICAL ENGINEER'S HANDBOOK BUILDING TRADES HANDBOOK ADVERTISER'S HANDBOOK BUSINESS MAN'S HANDBOOK BOOKKEEPER'S HANDBOOK STENOGRAPHER AND CORRESPONDENT'S HANDBOOK PLUMBERS AND FITTERS' HANDBOOK TELEPHONE AND TELEGRAPH ENGINEERS' HANDBOOK MARINERS' HANDBOOK

\$1.25 Handbooks for 50c.

No books in existence contain in so small space as much information about the trades and professions of which they treat as do these Handbooks. They are little giant encyclopedias of practical knowledge giving data and information that is hard to find in ordinary books. These Handbooks have been prepared by the well-known textbook writers of the International Correspondence Schools whose textbooks are recognized the world over as the most practical treatises on applied sciences ever published. These Handbooks are consulting experts of the highest rank, and are the most powerful force in the world for the promotion of ambitious men. They are an indispensable help to quicker and better work that will command advancement. They are printed on a high-grade book paper in clear type, and durably and handsomely bound in cloth with gilt titles; contain on an average of 364 pages and 175 illustrations and are regularly sold for \$1.25 each.

SPECIAL OFFER.—We are selling these Handbooks, durably bound in cloth with gilt titles, at a special price for each Handbook of 50 cents.

Mechanics'—Tables; formulas; measurements; belting; mechanical powers; hydro-mechanics; strength of materials; shafting; boiler design; care of boilers; power of boilers; chimneys; exhaust heating; machine design; machine tools; slide valve; pulleys; cylinders and steam chests; pistons; gearing; transit surveying; triangulation; curves; radii and deflections; earth work; track work; electricity; etc.

Advertiser's—How to plan and write an advertisement; type and type measurements; points on printing style; display; preparation of manuscript; proof reading; engraving and printing methods; electrotypes; matrices; advertisement illustrations; magazines; newspapers; retail, department-store, general, trade-paper, and mail-order advertising; trade marks; circulars; advertising agencies; etc.

Stenographer's & Correspondent's—Advice to beginners; shorthand speed; letters of application; punctuation; correct and faulty diction; business correspondence; type-writing; abbreviations; addressing; mailing; rates of postage; duplicating work; etc.

Telephone and Telegraph—Useful tables; mechanics; electricity; magnetism; primary batteries; storage batteries; electrical measurements; telephony; tests with magnetogenerator and bell; telegraphy; Morse telegraph systems; multiplex telegraphy; etc.

Electrical Engineer's—Mechanics; electricity; electrical units; symbols and quantities; physical and electrical properties of metals and alloys; wire gauges; magnetism; dynamos and motors; electric batteries; alternating current apparatus; alternators; transformers; wattmeters; electric transmission; electric lamps; wiring; electric heating and welding; electromagnets; controllers; car wiring; etc.

Business Man's—Arithmetic; tables; business forms; card systems; measures of extension; weight and capacity; time; value of foreign coins; duties on imports; bookkeeping; stenography; correspondence; postal information; financial terms; money and the money market; brokers and brokerage; patents; copyright and trade marks; corporations; business law; publicity; etc.

Plumbers and Fitters'—Arithmetic; involution and evolution; powers, roots, and reciprocals; circles; decimals; geometrical drawing; weights and measures; formulas; mensuration; mechanics; hydro-mechanics; building construction; heating and ventilation; gas-fitting; plumbing; etc.

Mariners'—Logarithms; trigonometry; navigation; terrestrial navigation; celestial navigation; organization of a man of war; naval ordnance; explosives; torpedoes; ship building; speed, tonnage, and fuel consumption; ropes; wind and weather; signals; nautical memoranda; etc.

Building Trades—Loads and structures; strength of materials; properties of sections; strength of rivets and pins; materials of construction; footings and foundations; masonry construction; woods used in building; qualities of timbers; joinery; framing; estimating; elements of architectural design; drainage systems; plumbing fixtures; plumbers' tables; heating and ventilation; gas and gas-fitting; etc.

Bookkeeper's—Arithmetic; formulas; tables; money; percentage; interest; equation of accounts; money and the money market; business law; financial terms; banks and banking; postal information; distances and time between various places; bookkeeping; business forms; card systems; modern office methods; cost accounting; bank bookkeeping; clearing house methods; etc.

International Textbook Co.

Box 872, SCRANTON, PA.

I enclose \$_____ for which please send me the books BEFORE which I have marked X.

☐ Mechanics' Handbook ☐ Advertiser's Handbook
☐ Elect. Eng. Handbook ☐ Business Handbook
☐ Bldg. Trades Handbook ☐ Bookkeeper's Handbook
☐ Plum. & Fit. Handbook ☐ Sten. & Corr. Handbook
☐ Tel. & Tel. Handbook ☐ Mariners' Handbook

Name _____

St. and No. _____

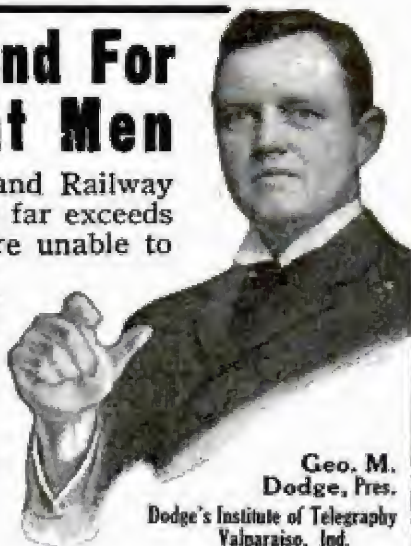
City _____ State _____

Please Mention Popular Mechanics

The Demand For Competent Men

in the Telegraph and Railway and Wireless Fields far exceeds the supply. We are unable to keep pace with the demand for our graduates. Greatest possibilities.

My Thorough Comprehensive Course of Instruction



Geo. M. Dodge, Pres.
Dodge's Institute of Telegraphy
Valparaiso, Ind.

enables my students to become proficient in a short time. I have the oldest, largest and best telegraph and railway instruction school in America. Established 1874. Thousands of my former students successfully employed everywhere. Railway and train dispatchers and Western Union Telegraph wires in classrooms. Complete high power wireless station, also an unexcelled course in railway accounting as applied to station agency work. ENROLL NOW.

Steady Work—Good Wages—A Bright Future

Expenses very low and may be earned while learning. Easy payments and many other big advantages. Large illustrated catalog tells all. FREE. Write for it now.

GEO. M. DODGE, Pres.

DODGE'S INSTITUTE OF TELEGRAPHY
8th Street VALPARAISO, IND.



DO YOU LIKE TO DRAW?

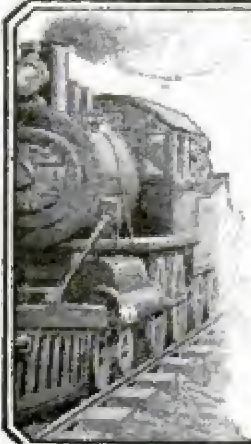
That's all we want to know

Now we will not give you any grand prize—or a lot of free stuff if you answer this ad. Nor do we claim to make you rich in a week. But if you are anxious to develop your talent with a successful cartoonist, so you can make money, send a copy of this picture with 6c. in stamps for portfolio of cartoons and sample lesson plate, and let us explain. The W. L. Evans School of Cartooning
321 Kingmoore Bldg., Cleveland, O.

LEARN WATCHMAKING

refined, profitable labor—Competent men always in demand. We teach it thoroughly in as many months as it formerly took years. Does away with tedious apprenticeship. Money earned while studying. Positions secured. Send for catalog. St. Louis Watchmaking School, St. Louis, Mo.

EARN \$100 TO \$200 A MONTH



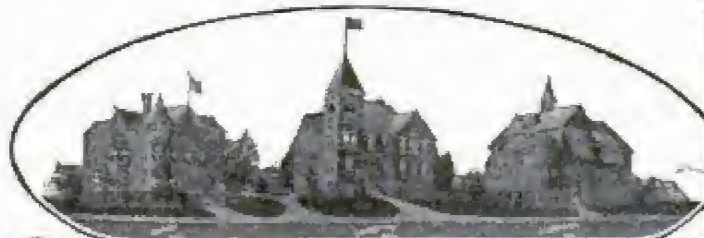
Be a Railroad Man

Hold the throttle of a monster Locomotive, travel 30,000 miles a year, see the country and earn big wages. Our

Self Educational Complete Practical Railroad teaching how to become a successful Locomotive Fireman and then an Engineer in quickest time at small expense. Learn in spare time.

FULL PARTICULARS SENT FREE

National Institute of Practical Mechanics
1325 Michigan Ave., CHICAGO, ILL.



Learn a Paying Profession

that assures you a good income and position for life. For seventeen years we have successfully taught

PHOTOGRAPHY

Photo-Engraving and Three-Color Work

Our graduates earn \$20 to \$50 a week. We assist them to secure these positions. Learn how you can become successful. Terms easy—living inexpensive. Write for catalogue—NOW!
ILLINOIS COLLEGE OF PHOTOGRAPHY, 999 Wabash Avenue, Edinham, Ill.

New York Electrical School

Offers a theoretical and practical course in applied electricity without limit as to time.

Instruction individual, day and night school, equipment complete and up-to-date. Student learns by doing, and by practical application is fitted to enter all fields of electrical industry fully qualified. School open all year. Write for free prospectus.

44 West Seventeenth St., NEW YORK



APPLIED ART PAYS

Study Applied Art at home.

Personal Correspondence System.

Eminent Instructors. More than twelve years successful teaching. Practical results guaranteed. Our students in demand by leading employers of artists. Applied Art Courses in Commercial Drawing, Illustrating, Teachers Normal, Fashion, Lettering and Design, Cartooning, Photo Retouching, Architectural Perspective, Etc. Endorsed by high authorities.

Residence Finishing School for Advanced Students. Artists' outfits furnished enrolled students. Year Book free.

SCHOOL OF APPLIED ART,

554 Applied Art Bldg., Battle Creek, Mich.

BE AN ILLUSTRATOR

by mail how to draw for magazines and newspapers.

Send for Catalog

Learn to draw.

We will teach you School of Illustration
112 Page Bldg.
Chicago, Ill.

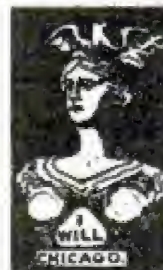


STUDY LAW

High-Grade Instruction by Correspondence Prepares for the bar. Three Courses; College, Post-Graduate and Business Law.

Nineteenth year. Classes begin each month. Send for catalog giving rules for admission to the bar of the several states.

CHICAGO CORRESPONDENCE SCHOOL OF LAW
558 Reaper Block, CHICAGO



I won the World's First Prize for best course in Penmanship. Under my guidance many are becoming expert penmen. Am placing many of my students as instructors in commercial colleges at high salaries. If you wish to become a better penman, write me. I will send you Free one of my favorite pens and a copy of the Ransomian Journal.

C. W. Ransom, 324 Minor Bldg., Kansas City, Mo.

6 ROADS TO SUCCESS

THESE PRACTICAL TRADES PAY \$5 TO \$8 A DAY

Come to the **Coyne National Trade Schools** and learn in a few months' time at small expense one of the 6 best paying trades in the world. Our graduates are always in demand at highest salaries. Hundreds of them are in business for themselves and are successful contractors.

Electricity



offers the greatest field in the world today. Thousands more skilled Electrical Engineers and Operators are needed. Wages are high and work steady, while the future offers the richest prizes in research work and new adaptation of electric power. Electrical science is only in its beginning, says Thomas Edison. The

future holds possibilities undreamed of. We teach thoroughly and practically every branch of electrical work. Our graduates are filling the highest positions everywhere.

Mechanical Drawing



is a most useful and attractive profession. Good Draftsmen command their own hours and conditions of work with highest salaries. We teach every detail of the work from ordinary plan drawing to most elaborate and intricate mechanical designing. Enroll at once. Positions assured all graduates.

Moving Picture Operating



is practically a new business and good operators are so scarce that unusually high wages are enjoyed. It's a fascinating work, and offers splendid fields for advancement to responsible and very high salaried positions. In our school the entire science and practical operation, care and maintenance of

the kinematograph is thoroughly and quickly mastered. Join the class now.

School Open All the Year

You can enter at any time. We have students 16 years of age to 60. Day and night sessions. Free Employment Department. Tuition and expenses very low. Easy payments if desired. Largest and best equipped trade school buildings in America.



Address, L. L. Cooke, Director

Our \$150,000 Building

COYNE NATIONAL TRADE SCHOOLS, 100 E. Illinois St., Chicago, Ill.

Plumbing



offers easy work, short hours, big pay and steady work. It's almost impossible now to learn the trade as an apprentice. Even then it will take years and perhaps you will never thoroughly master it. At this school in a few months you are graduated as a master workman, able to hold a job anywhere in the world. Not books but tools under actual working conditions used here. Plumbing offers splendid chances to start a business of your own.

Painting and Decorating



is of all trades the most varied and fascinating. It offers both outside and inside work and affords full scope for exercise of the artistic nature. We teach it all thoroughly, from painting and paper-hanging to finest color harmonies and mural decoration, including the almost lost art of glazing (or marbling?) Send for Special Catalog on Painting and Decorating.

Bricklaying



A highly paid, fine, healthy, outdoor occupation. Builders are always on the watch for competent Bricklayers. We teach Bricklaying by actual work on building operations — every branch of it, including the fancy finishing and cornice work which few workmen understand. Come now. You'll be a competent mechanic in a short time earning your \$5 to \$8 a day.

Tools and Materials Furnished FREE

Drawing and estimating a part of each course. Delightful opportunities for general and social culture. Ten minutes' walk to the heart of Chicago's business center.

Send for Book of the School. It's FREE. Send Now.

Stop Forgetting!

Now, What Was That Fellow's Name?
I Can't Remember Those New Terms.
I Know—But Can't Find Exact Word.
What on Earth Did He Say About It?



A Perfect Memory Is the Key to Success

The mind of the average person is filled with thousands of single unrelated ideas which waver and fluctuate with every emotion, like the billows of the sea.

The man with a Wandering Mind can never hope to Make Good—he will always be a drug on the market—he has too many competitors.

The great men of all ages are those who acquire the ability to concentrate and to memorize.

You Can Be Trained to Remember Accurately

In the business battle—matching wits each hour of every day—the ability or inability to think on your feet, to remember instantly and accurately means gain or loss. To succeed you must be "forget-proof." Just as surely as a poorly organized business can be placed upon a basis of perfect systematization and thereby made thoroughly efficient—so can your mind be trained and made a classified indexed and cross indexed filing system of facts so that you can command, on the instant, any thought, fact or argument.

The Dickson Method of Memory Training Will Do This for You

It will enable you to classify impressions, ideas, names, facts and arguments so as to have them ready at a moment's notice at any time. It will train you to think on your feet, to converse in a natural, interesting way, to overcome self-consciousness and bashfulness, to acquire easy, logical thinking. My course is not a theory, but is purely and absolutely scientific—the result of more than 20 years of close, intimate contact with students in schools and colleges and searching their developing minds for means of strengthening their memories.

I Want to Send You My Book, "How to Remember," Absolutely FREE

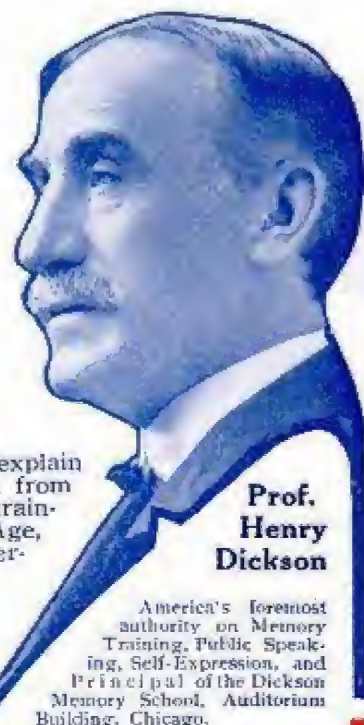
Simply clip the coupon and mail it today. It will explain clearly the course that has raised thousands of men from failures to great successes. You can have this same training. My free book is the first step. Don't delay. Age, education, vocation or place of residence makes no difference. Send the coupon today.

How to Get a Free Copy of This Valuable Book

De luxe edition handsomely illustrated, richly bound. Is exactly suited to meet the needs of the man or woman who desires to be a successful public speaker. The price of this 1911 de luxe edition is \$2.00. I will, however, present a copy absolutely free to every student who enrolls for my course of memory training within ten days after reading this offer.

Send the Coupon or Postal Today.

My method is highly recommended by ELBERT HUBBARD, PROF. DAVID SWING, and thousands of others. Ten minutes a day of your spare time will give you this training and not interfere with your work in any way.



Prof. Henry Dickson

America's foremost authority on Memory Training, Public Speaking, Self-Expression, and Principal of the Dickson Memory School, Auditorium Building, Chicago.

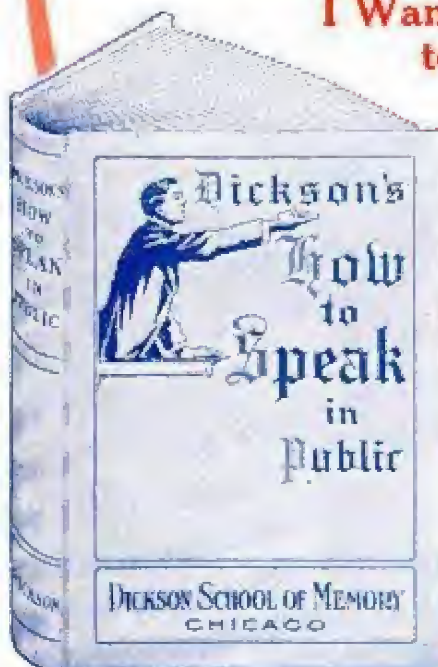
Prof. Henry Dickson
Principal, Dickson School of Memory
705 Auditorium Bldg., Chicago, Ill.

Send me free Booklet "How to Remember," also full particulars how to obtain a free copy of Dickson's "How to Speak in Public."

NAME.....

STREET.....

CITY.....STATE.....



LEARN TO REPAIR AND RUN AUTOMOBILES



EARN BIG MONEY IN AUTOMOBILE BUSINESS

as a chauffeur, repairman, salesman. Work pleasant. Big demand for trained men. Fine chances for starting automobile liveries, agencies, taxicab and repair companies. Learn the automobile—every part, and its mechanical operation thoroughly and practically in a few weeks. Write today for our interesting free book and learn about the tremendous opportunities everywhere in

this new business and our excellent course of training.

KANSAS CITY AUTOMOBILE SCHOOL

(Conducted by CLIFF HOGAN)

(Largest and Best Equipped Automobile School in America)

2139 E. 15th Street, Kansas City, Mo.



LEARN THE AUTO BUSINESS

EARN A SPLENDID SALARY

Automobile mechanics, salesmen and chauffeurs are in demand at big salaries. A course in our splendidly equipped resident school prepares for the best positions. Hundreds of successful graduates. Course includes actual practice repairing and driving high powered cars. Complete training in 4 weeks.

SEND TODAY FOR BOOKLET F.

CLEVELAND AUTOMOBILE SCHOOL, 2167 E. 9th St., Cleveland, O.

LEARN TO WRITE ADVERTISEMENTS

EARN \$25 to \$100 A WEEK

How to increase your salary. BOOK MAILED FREE. PAGE-DAVIS CO., 112 Page Building, Chicago, Ill., or 150 Nassau St., New York



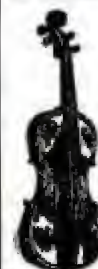
I TEACH SIGN PAINTING

SHOW CARD WRITING or LETTERING by mail and guarantee success. Only field not overcrowded. My instruction is unequalled because practical, personal and thorough. Easy terms. Write for large catalogue. CHAS. J. STRONG, Founder

DETROIT SCHOOL OF LETTERING
DEPARTMENT PM. DETROIT, MICH.

"Oldest and Largest School of its Kind"

Learn to Play the Violin, Cornet



or some other instrument. There's no pleasure equal to music. Helps you make friends and enjoy life. We include with every instrument an Instruction Book and Lessons (by correspondence) free. Thousands have learned by this method. Our prices are very low on all musical instruments. We import our Violins direct from best European makers. Our Special Complete Violin Outfits at \$10 are great value. Others from \$2.50 to \$25 and up. Cornet Outfits, complete, \$9.25 up. Band Instruments of all kinds sent on Six Days' Trial. We sell for cash or monthly payments. Satisfaction guaranteed. Write postal card or letter for free catalog. Say what instrument you are interested in. Write today.

W. J. Dyer & Bro. (Estab. 1870) Dept. 25, St. Paul, Minn.



Why Don't You Wear Linene Collars?

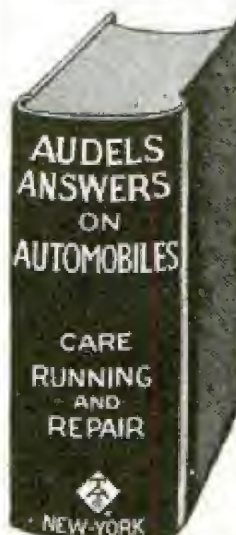
Now, honestly, is it for any real good reason except that you have never tried them? Send us 6 cents in U.S. stamps for sample and give it a fair trial. Or, better still, buy a box of 10 for 25 cents at the store or send us 30 cents to cover cost of mailing you a box. State size and style, but try them, anyway.

REVERSIBLE COLLAR COMPANY
Department U, BOSTON, MASS.



AUTO ANSWERS

FREE FOR EXAMINATION



Are you interested in automobiles? If so, let us send you on seven days' free trial—without deposit—this big, new 512 page illustrated manual, entitled "AUDELS ANSWERS ON AUTOMOBILES." It is impossible to get the greatest efficiency out of a car until you know every point in running, caring for and adjusting the machine.

In this new book just the problems you are up against are solved in a way that you can easily understand, and so that you can immediately turn to your car and apply the knowledge.

We don't want you to take our word, or anyone else's for it. We are willing to send you the book without deposit. Use it seven days in connection with your car. Then send back the book or remit \$1.50. Could anything be fairer?

Cut out and fill in your name and address plainly at the bottom, place it in an envelope and mail. Your copy of "AUDELS ANSWERS ON AUTOMOBILES" will reach you by return post, prepaid.

Price, \$1.50

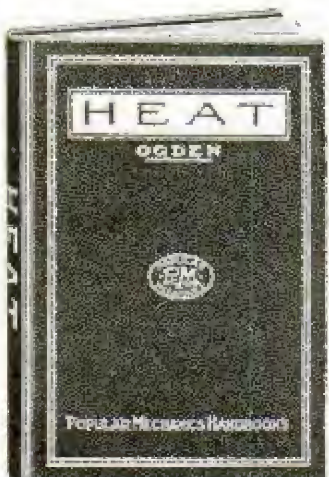
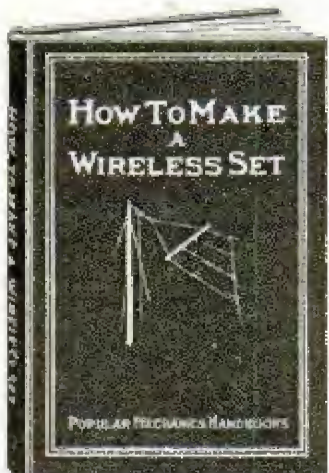
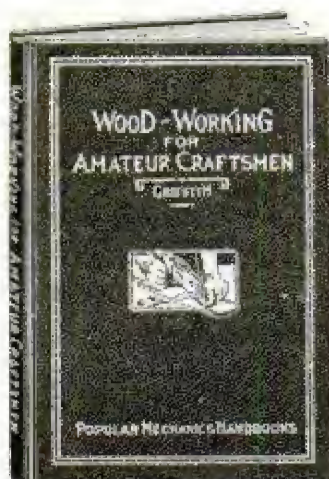
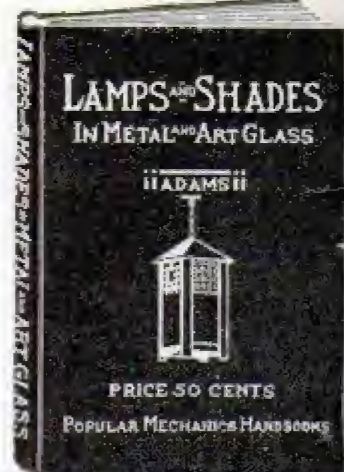
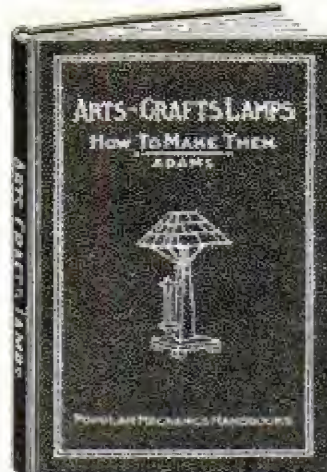
Theo. Audel & Co., 63 Fifth Ave., New York

Kindly mail me copy of Audels Answers on Automobiles, and, if found satisfactory, I will immediately remit you \$1.50, or return the book to you.

NAME.....

OCCUPATION.....

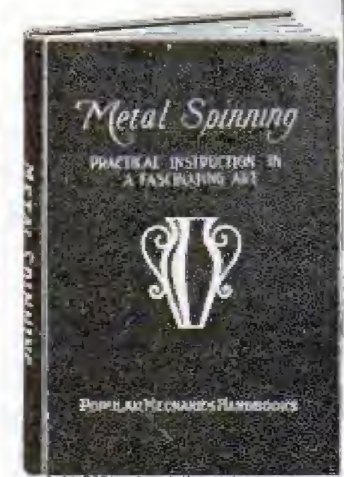
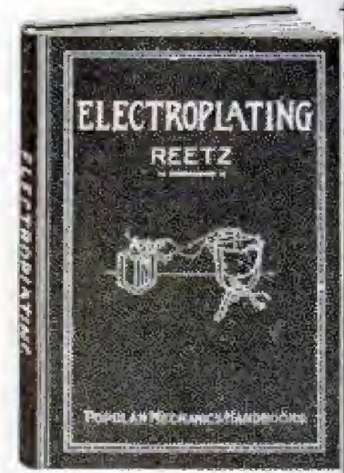
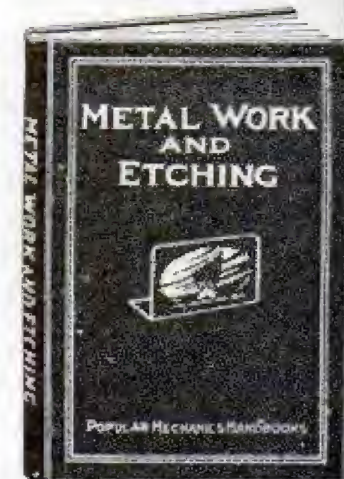
ADDRESS..... Dec. P. M.



Learn a Useful Craft

MANY a man finds the home workshop a continual source of pleasure and profit, and there is no end to the designs in furniture, artistic lamps and metal work that may be reproduced at slight expense; to say nothing of the desirability of being able to do the countless little repair jobs continually arising about the house.

A great variety of designs and complete instructions for working them out will be found in our *Mission Furniture, How to Make It*, (2 vols.)—*Arts-Crafts Lamps—Lamps and Shades in Metal and Art Glass*, and *Metal Work and Etching*, while *Wood-Working for Amateur Craftsmen* gives every essential step required for learning this useful trade. *Electroplating* and *Metal Spinning* are practical working manuals which everyone engaged, or about to engage in these occupations should possess. The experimenter will delight in *How to Make a Wireless Set*, and the story of *Heat* written by Prof. Ogden is an immensely interesting and instructive book pertaining to heat and its relation to modern mechanics. In short



Popular Mechanics Series of Industrial Handbooks

"WRITTEN SO YOU CAN UNDERSTAND IT"

Constitutes a useful, compact library of mechanical information that is unequalled.

These books are written by practical experts who not only know the best practice, but know how to impart that knowledge to others. These titles now ready:

Mission Furniture, How to Make It—Part I, 21 designs,	96 pages
Mission Furniture, How to Make It—Part II, 32 designs,	128 pages
Wood-Working for Amateur Craftsmen	128 pages
Arts-Crafts Lamps, How to Make Them, 16 designs,	96 pages
Lamps and Shades in Metal and Art Glass, 18 designs,	128 pages
Metal Work and Etching,	96 pages
Electroplating,	112 pages
Metal Spinning,	80 pages
How to Make a Wireless Set	96 pages
Heat	128 pages

OTHERS TO FOLLOW

A uniform series printed on the best book paper and durably bound in extra cloth. Size 5 x 7 inches. Artistic cover designs in gold and white.

Price Each, 50 Cents Postpaid

ORDER OF YOUR DEALER OR SEND DIRECT TO THE PUBLISHERS

Popular Mechanics Book Department, 318 W. Washington St., Chicago

PHILADELPHIA NORTH AMERICAN—Best sellers run away and hide when the author of "The Shepherd of the Hills" comes into the running.

"A book that will mould and make nations"

BEST SELLING BOOK IN THE WORLD

Ideal Christmas Gift

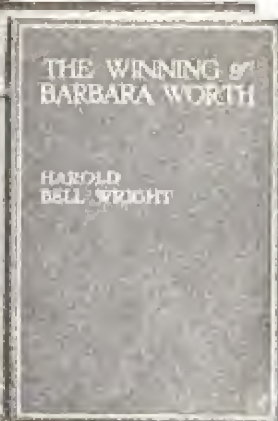
Wholesome — Beautiful — Appropriate

For All People Everywhere

A Present-Day Story of Reclamation

By Harold Bell Wright, Author of

"That Printer of Udell's" "The Shepherd of the Hills"
and "The Calling of Dan Matthews"



Cover—Red and Gold



Jacket—Full Color

THE WINNING OF BARBARA WORTH

One Continuous Printing
500,000 COPIES

The Illustrations, secured at great cost, made on the scenes of the story by Mr. F. Graham Coates, are six in number with the addition of Jacket in Colors

Cloth, 12mo, 512 Pages, \$1.30 Net

Q **Boston Globe**—As true to life as snapshots caught by moving-picture cameras.

Q **Cleveland Plain Dealer**—The best thing he has done so far ** a twentieth century epic.

Q **Minneapolis Tribune**—The Story in its lofty entity is surcharged with the exceptional and perpetually "wholesome" genius of Harold Bell Wright.

Q **Chicago Record-Herald**—It is a novel with "body," with a large and timely idea back of it, with sound principles under it, and with a good crescendo of dramatic thrills.



Q This illustration shows a copy of "The Winning of Barbara Worth" ready for delivery to a customer, wrapped and tied with special "Barbara Package Band" (no ordinary string used). A beautiful package for presenting to a friend or can be sent through the mail at ordinary book postage rate (it is not sealed). If you ask for it, your dealer will sell you a copy of "The Winning of Barbara Worth" wrapped and tied with special "Barbara Package Band," like shown in illustration, without extra charge.

Other Novels by Mr. Wright, Bound in Uniform Style With Above. With Illustrations, 12mo, Cloth, Each \$1.50

That Printer of Udell's—The Shepherd of the Hills—The Calling of Dan Matthews

Q **Mouth to Mouth Advertising** has made Harold Bell Wright the most popular living author because his books "make good." By special arrangement "The Calling of Dan Matthews," the most widely discussed book in the world, has been published in the Popular Edition. Harold Bell Wright's Ozark "Life Stories," "That Printer of Udell's," "The Shepherd of the Hills" and "The Calling of Dan Matthews" are all now published in the Popular Edition, and are For Sale Wherever Books Are Sold.

Q **The Winning of Barbara Worth Will Not** be published in the popular edition.

The Uncrowned King

A Christmas Classic

New York Tribune—"It embodies the aspiration, civic and moral, of the present day."
Grand Rapids Herald—"It is the greatest story since Bunyan's 'Pilgrim's Progress.'"
Omaha World-Herald—"It is a classic in nature and spirit and rendering."
Buffalo Evening News—"It represents dreams of artistic magnificence."

Frontispiece and Ten Illustrations in Color by John Rea Neill. Over 100 pages. 16mo (4 $\frac{3}{4}$ x7). Bound in Red and Gold—Cloth, 75 Cents Net. Full Leather, Gilt Top. Boxed, \$1.25 Net

Mr. Wright's Books Are For Sale Wherever Books Are Sold

Or Send Your Order to the Publishers—The Book Supply Company

Our mammoth catalog, size 8 $\frac{1}{2}$ x5 $\frac{1}{2}$ inches, advertises books of all the publishers at big savings. Bibles, Periodicals, etc. Write us for it today. Bargains on every page. Books on all subjects. Hundreds of Fine Sets and Fine Bindings for your library. Every book carried in stock. Orders filled promptly. Big savings. Catalog sent postage prepaid, free on request.

BOOK CATALOG FREE

THE BOOK SUPPLY COMPANY, Publishers and Booksellers

ESTABLISHED 1895

E. W. REYNOLDS, President

231-233 West Monroe St., CHICAGO

DIVISION SUPT.
\$3000 A YEAR

MASTER MECHANIC
\$3500 A YEAR

CIVIL ENGINEER
\$2000 A YEAR

ASST. SUPERINTENDENT
\$2500 A YEAR



YOU can do what others do!

You *can*—if you really want to. You can fit yourself to earn *more* than the other fellows. For they are not naturally any smarter than you. They haven't any more brains or ambition than you. They don't work any harder than you. They are simply *trained men*—that's the difference. They have *special knowledge* that you don't possess—*special knowledge* and *training* that makes them *worth more* to their employer than you can possibly be until *you* equip yourself with special knowledge and training.

The American School is training *hundreds* of men to become draftsmen, engineers and architects. It is training hundreds to fill executive positions, to earn *good* salaries, to play a man's part in the business game. *And what the American School of Correspondence is doing for others it can do for you.*

Opportunity Coupon

American School of Correspondence, Chicago, U. S. A.

Please send me your Bulletin and advise me how I can qualify for the position marked "X." Pop. Mech. 12-11

.....Aviator	.....Lawyer
.....Draftsman	.....Fire Insurance Eng'r
.....Architect	.....Telephone Expert
.....Building Contractor	.....Moving Picture Op'r
.....Structural Engineer	.....Book-keeper
.....Civil Engineer	.....Stenographer
.....Electrical Engineer	.....Accountant
.....Elec. Light & Power Supt.	.....Cost Accountant
.....Master Mechanic	.....Certified Public Acctant
.....Sanitary Engineer	.....Auditor
.....Steam Engineer	.....Business Manager
.....Refrigeration Engineer	.....College Preparatory

Mark the Coupon

and send it back to us *on the next mail*. That's the first step towards getting your name higher up on the payroll—the first step towards getting the kind of position *you'd like to have*, the kind of a salary *you ought to have*.

AMERICAN SCHOOL OF CORRESPONDENCE
CHICAGO, U. S. A.

NAME

ADDRESS

Popular Mechanics Magazine

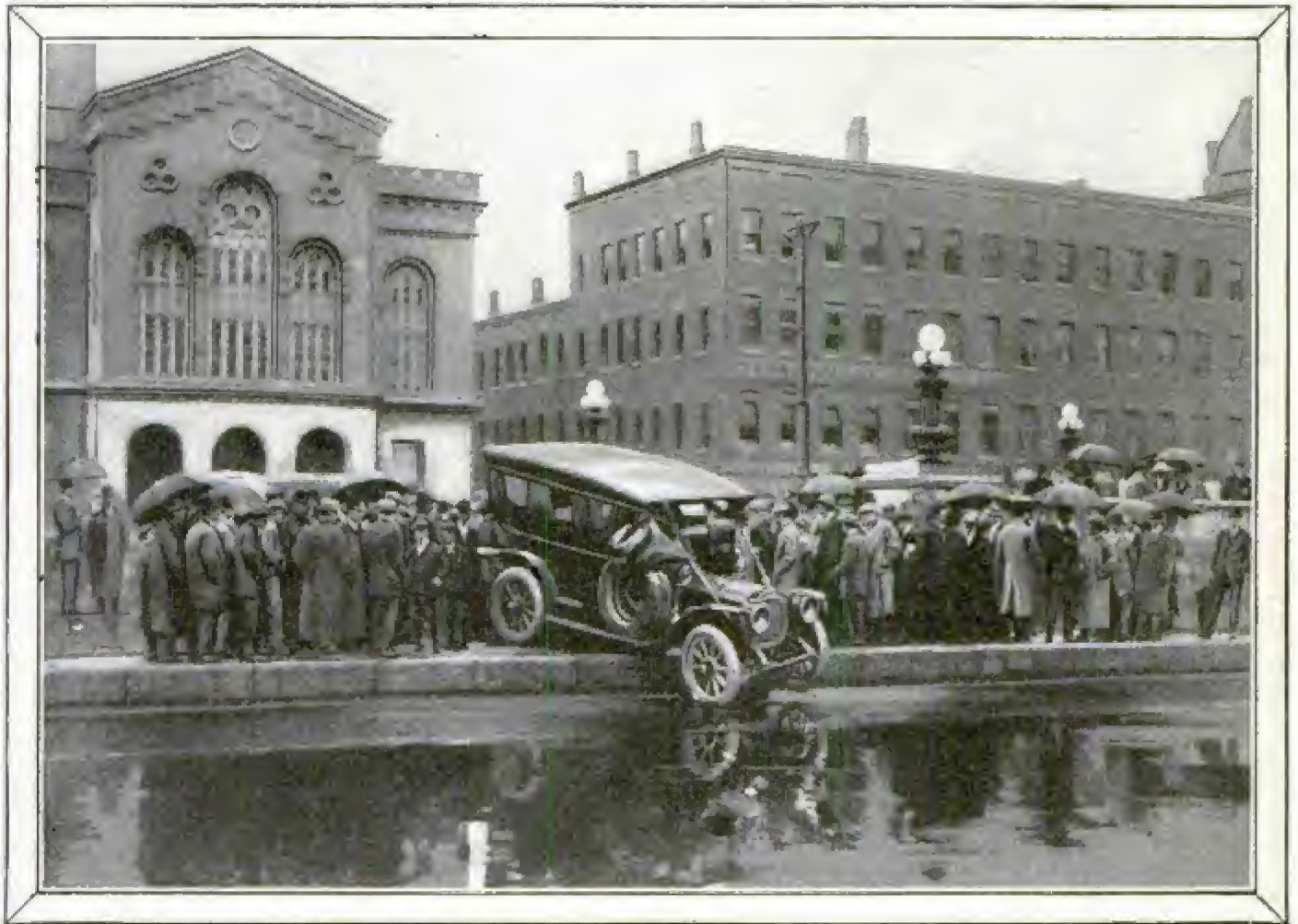
WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 16

DECEMBER, 1911

No. 6

Motor Flywheel Keeps Car Out of Canal



Automobile That was Saved from Plunging into the Erie Canal by the Flywheel of the Engine

THE flywheel on the motor of an automobile qualified as a life-saver in Syracuse, N. Y., recently, when it caught on the brink of the Erie Canal and prevented a big touring car and its five passengers from toppling over into the water. As the curtains were buttoned down and the front raised to protect the occupants of the machine from a driving rain, it is probable all of the passengers would have been drowned had the flywheel

failed to catch. The driver of the car thought the still, smooth surface of the canal was part of an asphalt roadway and was attempting to drive diagonally across it when the accident occurred. The front wheels went over, but the flywheel prevented further progress by catching in the stone coping. When the car was pulled back to safety it was found that no damage had been done beyond the unusual strain to which the chassis was subjected.



Steeplejack Ready to Leap

An Interesting Moment of the Jump

Landing Very Close to the Edge

A STEEPLEJACK'S DARING LEAP

Steeplejacks, through a spirit of adventure, often take risks which are not necessary, simply to accomplish some feat which is a little different from those they are called upon to carry through as a natural consequence of

their work in the air. Such a feat is shown in the accompanying illustrations, the steeplejack jumping from one skyscraper wall to an adjoining structure. A miscalculation would have meant a fall of 250 ft. How close the calculation was is shown in the third illustration, in which he may be seen landing very near the edge.

RAISING PIGS ON THE BOTTLE

An ingenious farmer of Norwood, Pa., having to deprive a litter of pigs of their mother, thus cutting off the natural sustenance of the little animals, found his pigs pining and getting thinner daily. They refused to be com-

forted with a bottle of milk offered to them in the way it is welcomed by the human infant, and he was compelled to invent a mechanical mother. Enough bottles were fitted to a frame to furnish each little pig with one, and the nipples of the bottles were left protruding through the framework.

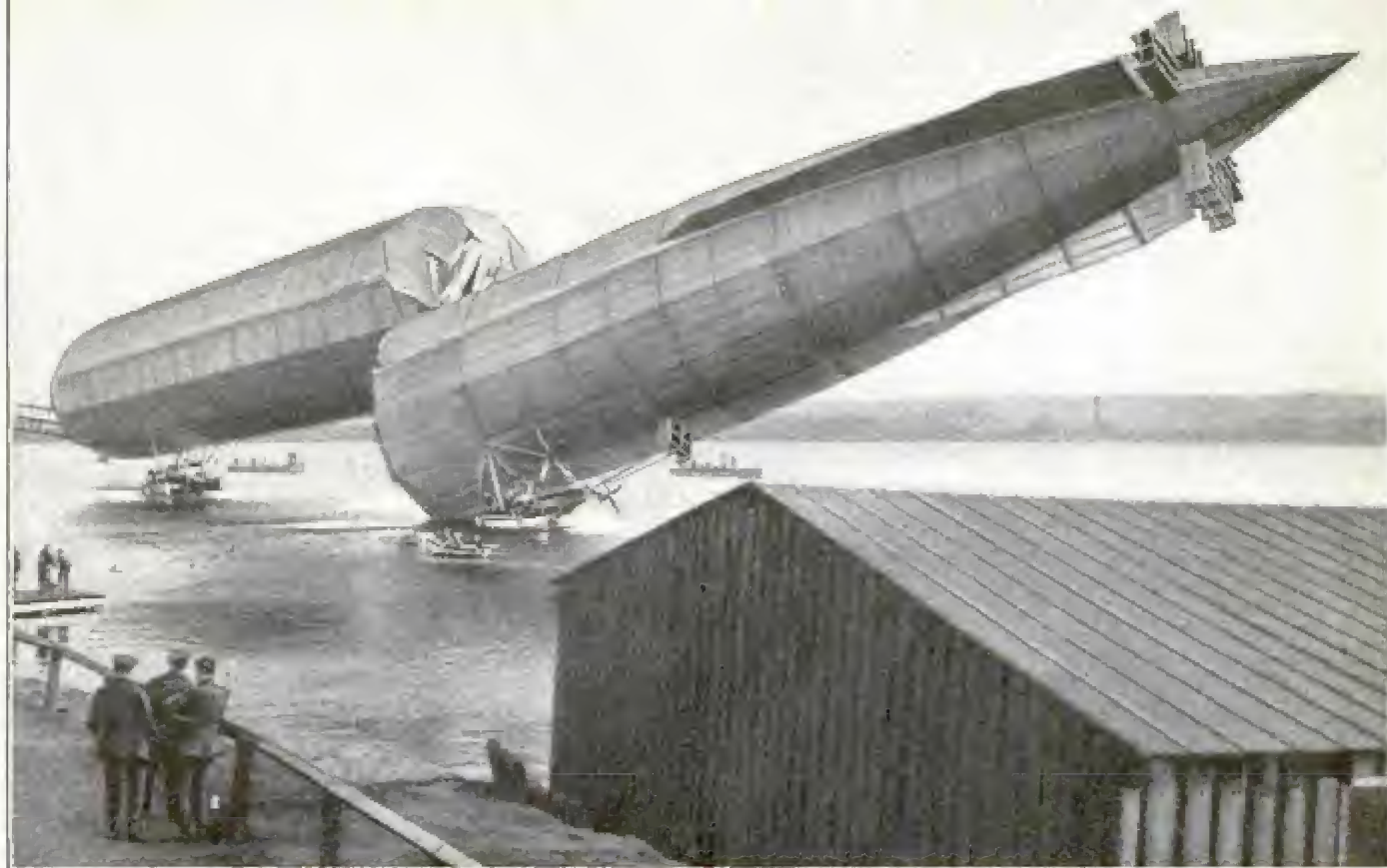
The deserted family took kindly to the mechanical mother.



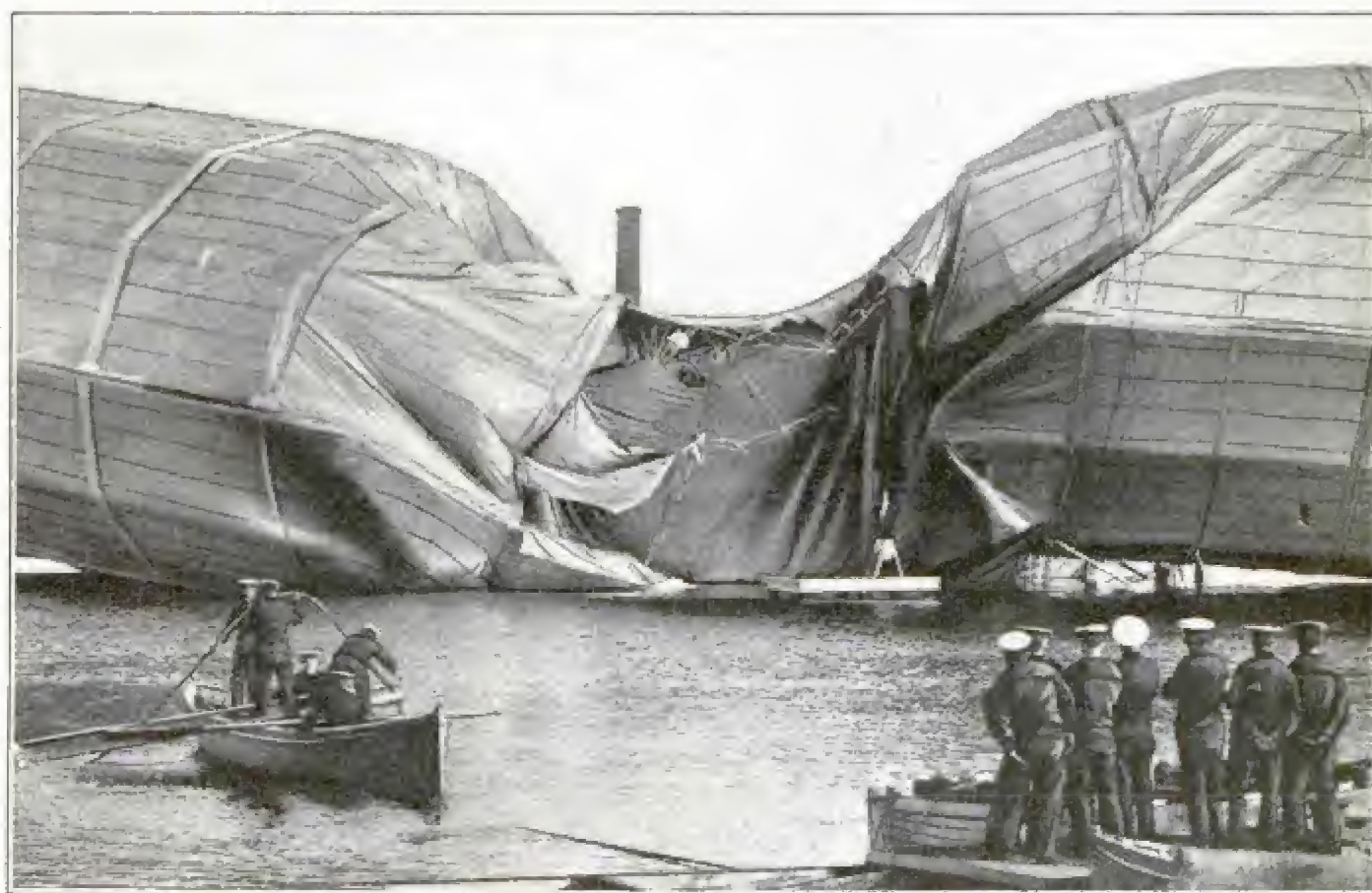
Orphan Pigs Fed with Nursing Bottles

PULP WASTE CONVERTED INTO WOOD ALCOHOL

The waste of pulp mills, manufacturing pulp by the sulphite method, ordinarily considered as useless, is now being converted into industrial alcohol by two pulp mills in Sweden. The output obtained through the installation of the special machinery amounts to from 100 to 115 lb. of absolute alcohol per ton of wood pulp made. The manufacturing cost of the alcohol is nine to ten cents per gallon.



The British Naval Airship as She Appeared Just after Breaking in Halves



Wreck of the British Naval Airship, Showing Its Appearance Where the Break Occurred

Another attempt will be made to launch the British naval airship which has cost \$400,000 to date, and which was wrecked at Barrow, Eng., Sept. 24. This is the dirigible that was finished in May but had never been tried because of unfavorable weather conditions. The framework of the great envelope broke in half as the balloon was being towed out of its shed, prior to an attempted trial, the break presumably being caused by the rupture of one of the 17 ballonets inside the envelope, thus placing an unequal strain on the frame.



Showing the First Stage of the Rescue of a Fire Victim in Cincinnati



To Safety at Last by Means of a Light Scaling Ladder

REMARKABLE PICTURES OF FIRE RESCUE

It rarely happens that even a newspaper photographer, who is supposed to be on the spot when anything big takes place, succeeds in obtaining such graphic photographs as are here illustrated. The first photograph shows a fire victim clinging to a fourth-story window ledge waiting to be rescued by firemen who had hoisted a ladder which fell a little

short of reaching him. Smoke and flame scorched his head and arms while waiting. The second photograph was taken a minute or two later as he was about to descend a light scaling ladder, the latter hooked into the sill above him and held by firemen on the large ladder and in the room underneath. The fire was in Cincinnati.

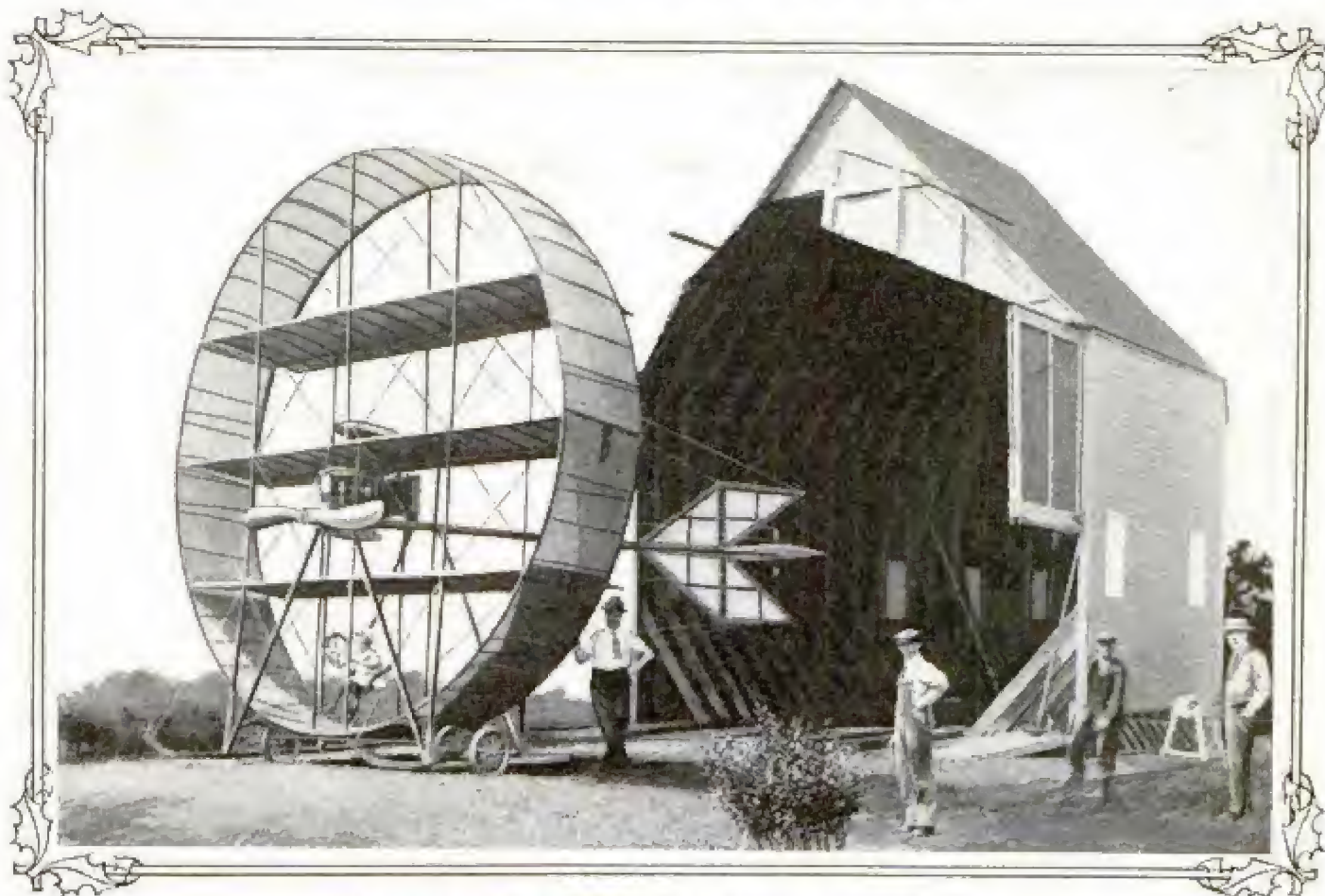


Automobile Plow Throwing Up a Trench on the Battlefield

AUTOMOBILE PLOW MAKES BATTLE TRENCHES

While industrial inventors have been at work harnessing motive power to plows for the tilling of the soil, a military inventor has applied the same principle to a plow especially designed for throwing up trenches on the battlefield as a protection for the soldiers.

ⒸTaxicabs are replacing 'rickshas and sedan chairs in Shanghai, China, a company having recently established itself in business there with a number of up-to-date vehicles.



A Curious Triplane Aeroplane within a Canvas Ring

NON-CAPSIZABLE AEROPLANE EXPERIMENT

An inventor of Paterson, N. J., is at work on a curious aeroplane which he believes will be non-capsizable. His object in developing this type of machine is to maintain lateral balance and furnish a means whereby it would be impossible for the machine to acquire an angle in descent that would result

in lack of control and a fall. The inventor claims that the non-capsizable feature of the aeroplane has been proven in gliding and in towing flights, but that the engine with which it is equipped, as shown in the illustration, has not proved powerful enough for flights.

CARRIED ASHORE ON TIDAL WAVE

When Tokio was visited recently by a typhoon and great tidal wave, dredgers, barges, and other small craft were lifted and thrown several hundred feet distant, some of them being pitched onto one of the main streets of the Japanese city, which they completely blocked. Among the heavier craft pitched high up on the shore and left stranded in the way of pedestrians was a Japanese torpedo boat.

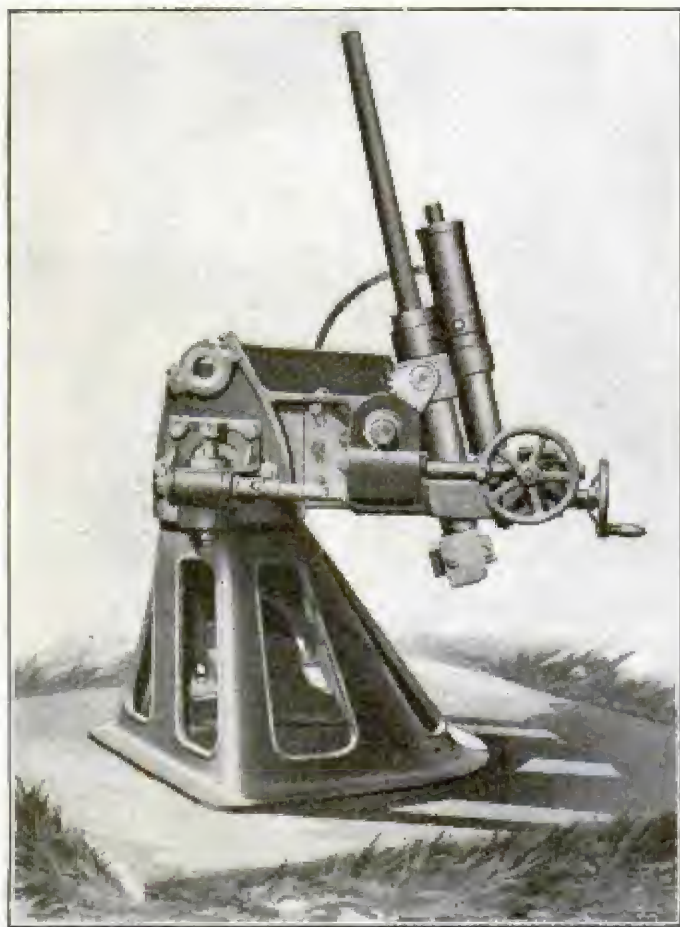
Airman Atwood estimates the expenses of his trip from St. Louis to New York averaged \$900 per day.



Torpedo Boat Which was Lifted Bodily on the Crest of a Huge Tidal Wave and Deposited in a Street in Tokio

NEW AMERICAN AERIAL WEAPONS

After shooting a shell 18,000 ft. into the air and closer to the skies than an aeroplane has ever flown, the experiments with the new one-pounder naval



Airship Destroyer That Shoots Shell to a Height of 18,000 Ft.

rifle, destined to destroy the airships of an enemy, were recently concluded at the Indian Head naval proving grounds near Washington. It was announced that the new weapon and its carriage had proven eminently satisfactory.

Fifty rounds were fired in the tests. The maximum range of 18,000 ft. was reached when the gun was elevated at an angle of 85 deg. The shot flashed accurately through a course for 10,000 ft. Beyond that distance it lost its velocity and was affected by the air currents, falling into the Potomac River, 1,500 ft. away from the spot where it had been reckoned it would drop. The airship-destroying rifle is the invention of Rear Admiral Twining, chief of the naval ordnance bureau.

The idea of this one-pounder will

be developed into a 3-in. gun. Naval ordnance experts believe that such a weapon would shoot 7 miles into the air with effect. The favorable performances of the new carriage caused naval authorities to express the belief that before long American warships will be equipped with another battery of guns to fight hostile invaders in the air.

Admiral Twining has also designed a dirigible aerial torpedo, which can be fired from an aeroplane or dirigible balloon at a hostile craft in the air or on the water, and at troops and fortifications on the ground. Like the submarine torpedo, it is self-propelling, and can be easily directed and controlled. It is fitted with a percussion fuse that is so sensitive that it will explode upon the slightest contact.

WAGON WHEEL USED AS MAILBOX TURNTABLE

Several residents of a suburb of Atlanta, Ga., whose houses are not on the exact line of the rural mail route adopted the plan of placing their individual boxes on a wagon-wheel turntable. The mail carrier drives up to the wheel and spins it around, thus bringing each box into a position in which he can reach it without leaving his wagon.



Nine Rural Mail Boxes on a Wagon-Wheel Turntable

GERMAN BABY CARRIAGES BEAR NUMBERS

Because of the similarity of baby carriages in Germany, a law has been passed compelling each car-



Numbered Baby Carriages Obviate Mistakes

riages to have a license number. So long as there is but slight danger of a nurse maid walking off with the baby and carriage after an airing in the parks.

LEVER DEVICE FOR TRANSPORTING MOTORBOAT

In the accompanying photograph is shown the clever method which was used to transport a motorboat from the factory where it was built to the lake

where it was launched, a distance of 150 miles. The 28-ft. vessel was secured upon an extra pair of rear wheels, which carried the greater part of the weight, while the bow rested on the chassis of the motorcar that towed it across country. The trip was made from East Moline, Ill., to Lake Delavan, Wis., in a little less than 24 hours, the manufacturer being at the wheel of the car. He states that the distance could have been covered in 15 hours but for a severe rainstorm lasting half a day, which transformed the dirt roads into seas of mire, just a little too thick for the motorboat and a little too thin for the automobile to navigate with any speed. In spite of the slippery roads, the trailer followed readily, and the method of transporting a seacraft by land was a pronounced success.

DIAMONDS SOMETIMES EXPLODE

According to a leading expert on crystallography, who gave a lecture recently before the Royal Society of Arts, in London, diamonds may explode. He cited many instances of diamonds exploding on being taken out of the diamond fields, and said that such explosions might occur months and even years after being released from the mines.

Diamonds, so it is presumed, were formed through the fusion of carbon at great temperature under such pressure as could exist only at great depths below ground. This expert points out,



Auto Used to Transport Motorboat

DENVER THROUGH A CLOCK FACE

The illustration shows how a section of Denver's business district looks as photographed through the 16-ft. face of an unfinished clock in the tower of one of its new buildings. The clockwork had not yet been set in place. The numerals shown are 3

this year, however, seems to be practical, as the temperature of the clock equipped with it is 30 per cent lower than the outside atmosphere.

The apparatus for cooling the clock comprises an ice tank having a capacity of 1,000 lb., an air refrigerator composed of a cylinder filled with water and containing vertical tubes through which the air is forced



Denver's Business District Photographed through the Face of a Large Clock

ft. long. The dome seen in the distance is that of the Colorado State Capitol.

COOLING DINING CARS OF EGYPTIAN ROAD

The problem of cooling the cars of the Egyptian State Railways, and especially the dining cars, in which the atmospheric heat is supplemented by the artificial heat from the kitchen, is one that has kept railway officials in that country busy for some time. A new type of plant introduced early

means of a revolving pump, and rotary pump for the circulation of the ice water. Both the air fan and pump are driven electrically, current being supplied by a dynamo driven by one of the car axles. The cars are also especially constructed for service in tropical heat. The usual teak paneling is doubled, the outer surface is painted white to reflect the sun's heat; the floors are double, with a cork sheet interposed between the two thicknesses, the roofs are provided with a double cover of cork and asbestos, and the windows have double panes of glass and louvered sun blinds.

therefore, that by the time the gems had worked their way near the surface through volcanic disturbances and earthquakes and were within reach of the miner, the great pressure was gone.

FREE MUNICIPAL LAUNDRY FOR THE POOR

Cincinnati has recently opened a municipal domestic laundry where poor women of the tenement districts may take the family clothing and do their own washing with the aid of the most up-to-date machinery. Thus, all the modern laundry mechanisms are brought within reach of the poorest families.

The equipment includes enough power washers, driers, and electric irons, to accommodate 500 family washings each week, and the city is preparing to build more laundries of like nature. The idea originated with the board of health, which was quick to recognize the sanitary advantages derived from removing clothes-washing operations from the living and sleeping rooms of the tenement dwellers.

AUTOMOBILE JUMPS FORTY-TWO FEET

While taking part in a hill-climbing competition at Poland Springs, Maine, one of the cars struck a gully at high



Courtesy Motor

Photographed while All Four Wheels were Off the Ground in a Leap Estimated at 42 Ft.

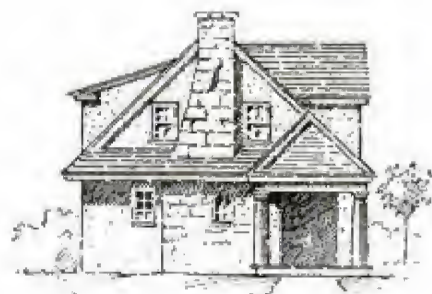
speed and made a leap estimated to be no less than 42 ft. before striking the road again. A photographer caught a picture of the car while all four wheels were off the ground.



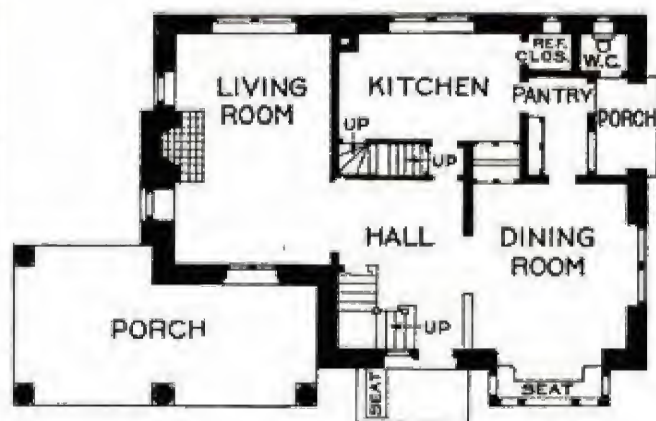
Cincinnati Tenement Women Preparing to Do Their Family Washing in the Municipal Laundry



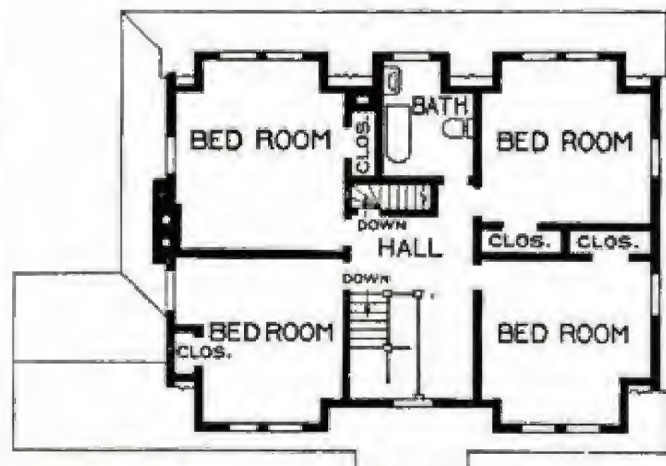
DUTCH COLONIAL
HOUSE



OF HANDSOME
DESIGN



First-Floor Plan



Second-Floor Plan

Wm. J. Ryder, Philadelphia, Architect

A Dutch colonial house that can be built for about \$4,800, makes a pleasing and attractive home that is entirely distinct from the usual run of moderate-price buildings. Economy of cost is obtained by constructing the walls of the basement and first floor of stone and the upper story of frame and stucco. The roof and pent eaves are to be shingled. The interior finish must be plain to come within the estimate. Provision is made for four bedrooms of good size on the second floor, a large living room, dining room and kitchen

on the first floor. Ample space for heating plant and storage can be provided in the cellar.

As a result of the general strike in England last summer there has been a universal demand throughout the British isles for a more general adoption of motor transportation, and manufacturers of trucks and delivery wagons have been swamped with orders for vehicles ranging in capacity from 2,500 lb. to 4 tons.

STREAMLINE FORM IN AEROPLANE DESIGNING

By VICTOR LOUGHEED

By special arrangement with the publishers of "Aeroplane Designing", a forthcoming book by Mr. Lougheed, Popular Mechanics Magazine is enabled in this article to give to its readers the first particulars of some new and most interesting discoveries in flight engineering, by the application of which the long-anticipated aeroplane of low power but high efficiency seems at last to be in prospect of early realization.

IT has been long understood that objects of certain shapes offer less resistance than do others of the same projected areas to rapid movement through the air and other fluids. But the reason for this phenomenon, despite a widespread knowledge of the forms that afford the most advantageous effect, seems not to have been heretofore detected, even by the most clever and resourceful investigators.

For this reason no intelligent or consistent application of these forms to aerial and submarine vehicles has been possible, and even the attempt to apply them has been widely neglected.

Yet the prevalence in nature of the streamline form is alone sufficient evidence of its vast superiority for its purpose. For—though modified in innumerable minor respects to meet special or individual conditions—its essential and fundamental characteristics appear in the body of every creature that moves with any but the lowest speed, through water or air.

In the water, from the smallest fishes to the largest whales, there is always the characteristic outline—in front either bluntly rounded or with the greatest thickness at or well forward of the middle, in combination with a more finely tapered rear body sloping back in reverse curves to a pointed or thin-edged tail.

The bodies of all birds present similar contours, and, as with the denizens of the deep, there is the same notable principle from which there is no deviation. For, regardless of variations in the heads of the different creatures, which present the greatest and most complex dissimi-

larity, there is never material departure from the apparently inescapable necessity for placing the greatest thickness forward of the center, and for providing the after portion of the body always with the finely tapered stream outline.

The type of body that offers a minimum resistance to movement through a fluid is that of the general streamline form illustrated in Fig. 1.

As has been previously explained, there is no novelty in the fact that such an object offers a minimum resistance to movement through a fluid, but the writer believes that the *reason* for this difference has not heretofore been understood, besides which he believes that the extent to which the streamline form is superior—the quantitative value of the differences between it and other forms—has been too little appreciated.

From the most casual analysis of the difference between the best aeroplanes and nature's flying devices it must appear, on the face of it, that something is wrong.

Modern aeroplanes fly with propeller thrusts in no case lower than one-fifth of the weight of the machine, making them literally constitute "horizontal helicopters." An extreme example is the Santos-Dumont "Demoiselle," in which the propeller thrust is 300

lb., with a total weight of machine and operator of only 400 lb.

All birds, absolutely without exception, are enormously more efficient. In no case that the writer has observed, with the most careful measurements that it has been possible to make, is the ratio between the weight



Fig. 1—Streamline Form Best Adapted to Movement through a Fluid with a Minimum Resistance

and the forward resistances in any bird higher than 1 to 320.

Of most pertinent interest, in this connection, are certain investigations by Sir Hiram Maxim, made about 15 years ago, into the resistances of different types of strut surfaces.

The illustrations and the caption in Fig. 2 present the forms involved in and the figures that resulted from Maxim's research, which he seems to have dropped when on the verge of most important discoveries—had he but sought for reasons as well as for data.

Before undertaking an analysis of the Maxim results, it will be well to digress briefly from the main subject, to consider some incidental matters of importance.

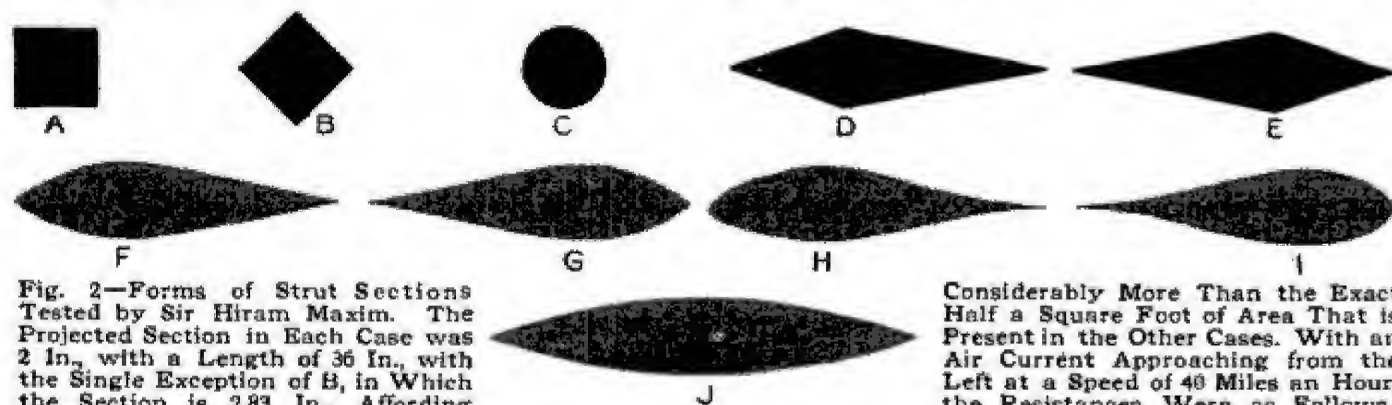


Fig. 2—Forms of Strut Sections Tested by Sir Hiram Maxim. The Projected Section in Each Case was 2 In., with a Length of 36 In., with the Single Exception of B, in Which the Section is 2.83 In., Affording

Considerably More Than the Exact Half a Square Foot of Area That is Present in the Other Cases. With an Air Current Approaching from the Left at a Speed of 40 Miles an Hour, the Resistances Were as Follows:

A, 4.56 lb. — B, 5.10 lb. — C, 2.80 lb. — D, 0.78 lb. — E, 1.22 lb. — F, 0.28 lb. — G, 0.42 lb. — H, 0.23 lb. — I, 0.59 lb. — J, 0.19 lb.

The resistances that aeroplane wings—and the other elements of an aeroplane structure—oppose to movement through the air constitute, of course, the measure of the power required to maintain the machine in operation. The accepted term to describe this type of resistance is "drift."

In its original sense, as employed by Chanute, who coined this use of the word, drift was understood to mean only what, for the sake of more accurate characterization, the writer prefers to distinguish as "aerodynamic drift"—the backward-acting element of the sustaining pressure under an aeroplane surface.

There are, however, two other ways in which a flow of air may tend to drift an object along with it, a condi-

tion that has led to confusion by complicating analysis as well as by confusing observation.

Thus, as an element in the total drift, there is the "frictional drift," due to the grip of the air by skin friction on the wings and other surfaces.

And in addition to the foregoing there is always the direct pressure of the air against the edges of wings, and the other elements involved in an aeroplane. This pressure is commonly figured as "head resistance," calculated in accordance with the accepted tables of wind pressure on the basis of the total projected area of the machine.

So it is seen that the total forward resistance, or drift, of the usual aeroplane, which must be overcome by the propeller thrust, is a composite of

three sub-types of resistance—"aerodynamic drift," "frictional drift," and "head resistance."

While the foregoing is a correct classification as applied to present aeroplanes, it is so only because these are ill-designed, and in the course of this article the writer will undertake to show that it becomes a loose and incorrect classification with well-designed machines.

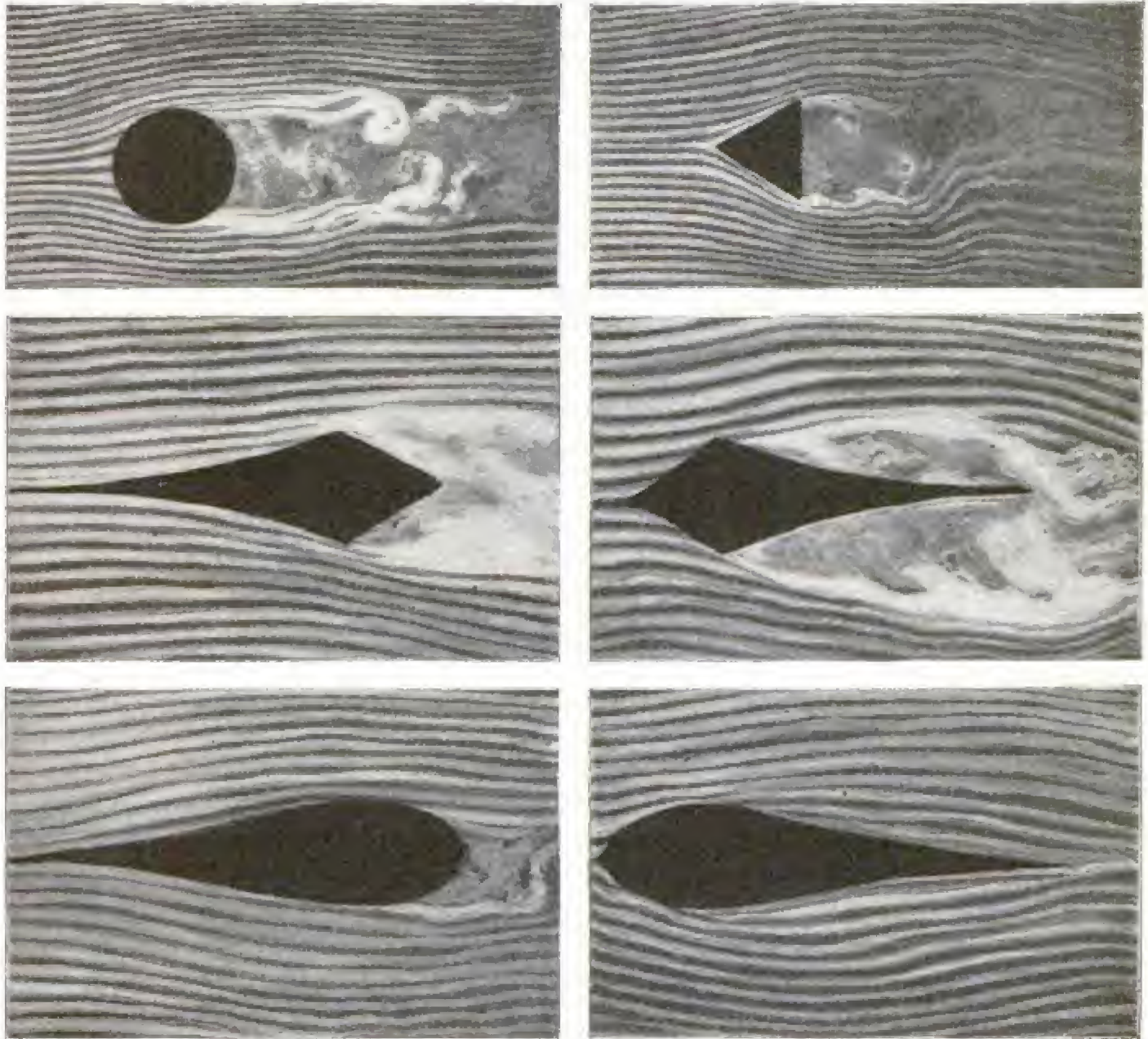
To consider first the aerodynamic drift, this has been reduced in at least a few fast modern machines to so small a proportion as one-twentieth of the lift, requiring for the purpose of overcoming it, for example, only 50 lb. propeller thrust to fly a 1000-lb. machine.

In the matter of the skin friction,

this, at most, does not exceed 15 or 20 lb. in an average aeroplane, at usual speeds of operation.

But when it is found that the total projected area of the average aeroplane will range from 20 to 35 sq. ft., against which the pressure will

ers, seeing no deeper than these obvious facts, have sought to reduce the aerodynamic drift, while at the same time paying some attention to the skin friction, but in the matter of head resistance have proved able to do no more than to cut down as much as



Courtesy L'Aerophile

Fig. 3—Flow of Air Streams around Various Solid Forms. Note That the Difference in the Width of the Tract of Air Disturbed in the Cases of the Forms that Afford Poor Results is Nowhere Nearly Sufficient to Account for the Difference in Resistances. These Photographs were Secured through the Top of a Glass-Roofed Wind Tunnel, into One End of Which Smoke was Admitted through a Comb-Like Screen

average over 10 lb. to the square foot at 60 miles an hour, it becomes at once evident that there can be no other adequate explanation than that of excessive head resistance to account for the 300 and 400-lb. thrusts necessary to fly present aeroplanes, which range from 35 to 80 miles an hour in speed.

The generality of aeroplane design-

possible, not the head resistance, but the projected area occasioning it.

And, since the head resistance constitutes by far the greatest portion of the total resistances, it is obvious that without definitely reducing it no great progress can be made toward the ultimate ideal of flight with little power.

It will be now in order to return to a consideration of Fig. 2. To an

investigation of the phenomena observed with these, the writer has, recently devoted considerable time.

The result has been the discovery of a heretofore overlooked aerodynamic phenomenon of the utmost importance in its relation to the energy requirement, and which, by means of application of its principles, is destined beyond question to contribute the essential basis to a new era of airplane progress.

In the Maxim experiments, it is first to be noted that all of the ten different struts, A to J, inclusive, Fig. 2, are of the same thickness of projected section—exactly 2 in., with the single exception of the strut B, which is the same as A except that it is turned so that it stands cornerwise instead of flatwise to the air flow.

In a tabulation of the effects secured with these different figures, the results seem at first most paradoxical, but subsequently reveal themselves as possessed of the most astonishing significances. Briefly to consider them, it is first to be noted that, though the projected area of B is increased by $41\frac{1}{2}$ per cent over the projected area of A, the pressure acting against it is increased less than 12 per cent.

Second is the observation that, in the case of a $22\frac{1}{2}$ -per-cent increase in the speed of the air current applied to A and C, the pressure acting against the square bar increased over 13 per cent while that against the round bar increased only 6 per cent. Had the increase been with the square of the speed, as the armchair experts have it, the pressure against both bars should have increased 48.8 per cent.

Most extraordinary, of course, is the remarkable lowering of the resistances in the elongated sections from D to J, inclusive, as compared with the resistances of A, B and C. For the most extreme example, it is to be noted that the

resistance of J is only $\frac{1}{4}$ of that of A, so that, if 24 hp. were required to move a number of struts like A through the air, by changing their section to that of J one horsepower would suffice—an elimination of $\frac{23}{24}$, or nearly 96 per cent of that originally demanded.

This enormous variation in resistance, in the face of the fact that most experimenters have been wont to assume, probably correctly, that the actual head resistance of an object moved through the air is not affected so much by the form of its front portion as by its projected area, is obviously worthy of the profoundest study.

That the form of the front portion of a streamline body does not greatly affect the head resistance is probably correct, it having been repeatedly observed in automobile races at extremely high speeds that cars with pointed fronts are not materially faster than those with square fronts. Further evidence is found in many wind-tunnel experiments, and presumably the fact behind the effect is that, if a form is other than that best adapted to penetrate the air with a minimum resistance, inert air massed against it will automatically assume such form, and thus in large measure supply the lack.

A common hypothesis to account for the greater resistances of such forms as A, B and C, as compared with those from D to J, has been premised upon a supposition that the air in some manner banks up against the front or eddies along the sides of the bad forms in such a manner that with these the width of the disturbed tract in the air is greatly increased over the projected section

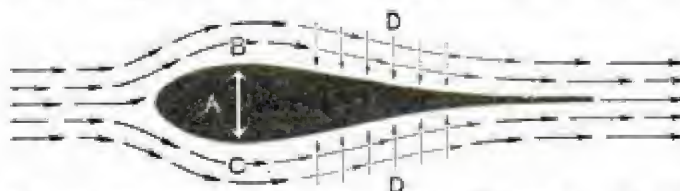


Fig. 4—Streamline Form A Passing Through a Fluid. The Energy Expended in Parting of the Fluid Streams to the Projected Distance B C is in Large Measure Recovered by the Reaction Pressures D D

of the object. But reference to Fig. 3 will show that this conclusion must be abandoned, now that wind-tunnel experiments, accompanied by methods of rendering photographically visible

the disturbance and separation of the air streams flowing around solid objects immersed in them, prove the separation of the parted air currents to be not, after all, materially greater in the case of the shapes that offer high resistances than they are in the cases of properly formed streamline bodies.

The conclusion is forced that some other explanation than that of greatly differing head resistances is necessary to account for the extraordinary superiority of streamline forms, as compared with others.

And this explanation, by scientific analysis and deduction, as well as by processes of experimental elimination and demonstration, has been found to exist solely in a heretofore unsuspected effect exerted on the rearward portion of a streamline form—and lacking in the cases of other forms—whereby *the elements of the parted body of air spring together again after they have passed the point of maximum separation, and thus nullify the head resistance almost completely by a definite propelling pressure exerted against the tapered rear of the body as it escapes* from between the wedged-apart masses of the surrounding atmosphere.

This action is found to be so extraordinarily efficient that it certainly renders totally unnecessary and definitely wrong the use of thin wing surfaces and other elements in aeroplane structures now that it has become evident that the reduction of head resistance is of only the slightest importance as compared with the importance of utilizing the wonderful means available for recovering almost the whole of the energy expended in overcoming the head resistance.

This beautifully simple, though heretofore profoundly obscure and unrecognized example of the marvelous interrelation of aerodynamic laws, is illustrated in Fig. 4, in which, after the

parting of the air streams by the streamline form A to a maximum separation of the projected distance BC, there follows the closing together under pressure of the adjacent masses

of the atmosphere, as is indicated by the short arrows at DD.

The condition is perhaps more lucidly explained in Fig. 5, in which the object A is to

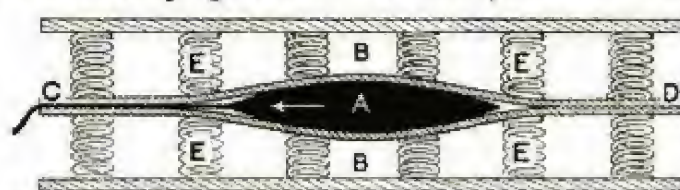


Fig. 5—The Principle of the "Reaction Impulse." Streamline Form A Moved in Direction of Arrow between Well-Lubricated Flexible Belts BB. Springs behind Belts Represent Elastic Fluid and Return a Large Proportion of the Energy Expended by Forward Motion of Streamline Form.

be considered as being drawn along in the direction of the arrow between the two flexible belts BB, which normally are held together, as at C and D, by the series of springs EE. With the form A and the belts well lubricated, it is obvious that the energy required to move A would have to be sufficient to compress the springs EE, if the rear end of A, instead of being wedge-like as shown, were squared off. This is because the springs would simply snap back after passing the points of maximum compression, with practically no recovery of the energy expended in compressing them.

But with the finely tapered rear outline it is clear that the pressure of the springs against the belt must tend to propel A in the direction of the arrow, for all the world like a watermelon seed projected from between the moistened fingers of a small boy. There is the difference, however, that, as compared with the most perfectly-lubricated solid surfaces, in the case of the air the friction is so low, the air so perfectly elastic, and the pressure so advantageously applied, that with good design the action is probably one of the most efficient known in engineering—96 per cent efficient in the case of the section J, Fig. 2, and undoubtedly well over 99 per cent in the case of the bird.

To the January issue of Popular Mechanics Magazine, Mr. Loughheed will contribute an article, in which he will discuss more in detail effects of these new discoveries upon the practical design of aeroplanes.

GROWING TREE LIFTS MILLSTONE

This millstone, discarded by a mill at South Dover, N. Y., many years ago, has been a subject of surmise for years, and, seemingly, none of the surmises were fulfilled. After the stone had been discarded some time, a seedling popped its head through the eye, and, as the seedling grew into a tree, people began to watch and prophesy as to what would happen when it at last filled the stone. Some insisted that it would burst the stone just as a wedge of wood will split a slab, and others believed the tree would simply expand above its stone collar and reach its natural proportions. What has actually happened up to the present time is shown in the illustration, the tree lifting the stone from the ground and carrying it suspended.



TUBULAR RADIATOR FOR AUTOMOBILES

A new radiator for automobiles, which consists of a series of tubes, that are run horizontally for machines using a pump and vertically for those using a siphon system, has been invented by a French motorist. The tubes are about half an inch in diameter and are pierced by tubes about one fourth of an inch in diameter. The smaller tubes are open at both ends to permit the free circulation of air while the water goes through the larger tubes. In this way the water is continually running over the air tubes and is thus kept cool. The

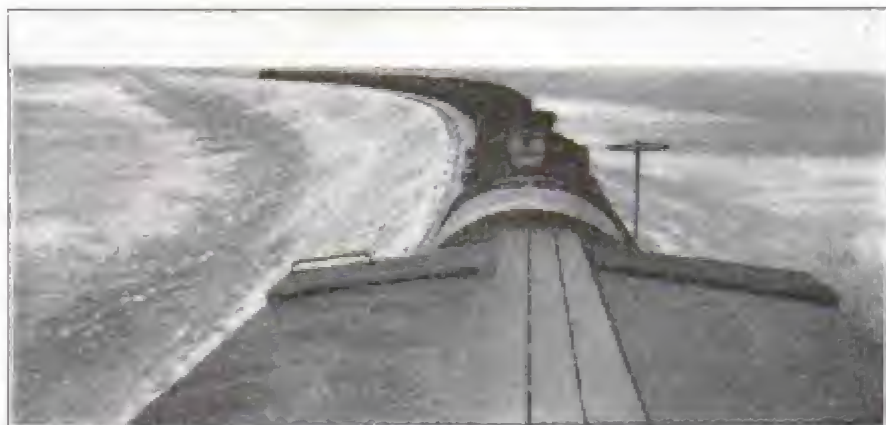
total weight of the radiator for a 12 or 14-hp. engine is about 28 lb. Each tube is mounted separately and, in case of accident, one or more of them can be taken out and replaced by a new one.

HIGH-SPEED ALTERNATORS

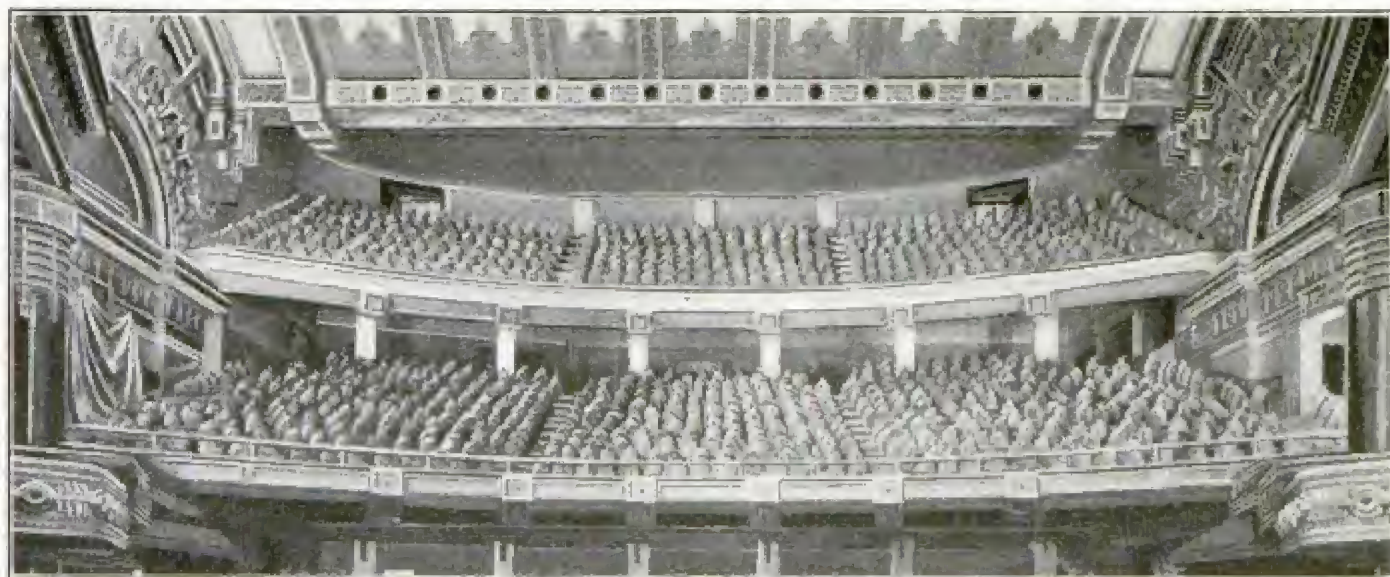
The difficulty to be overcome in the construction of high-frequency alternators, seeing that the frequency depends on the rotary speed and the number of poles, is that the peripheral speed of any rotating machine is restricted by mechanical limitations. Alternators of as high frequency as 100,000 per second have been constructed, but the output is very small on account of the reduced size necessary in obtaining high speed.

A German inventor, however, has constructed an alternator, at present operated in the wireless station at Eberswalde, Prussia, which gives 12 kilowatts for 30,000 frequencies, and 8 kilowatts for 60,000 frequencies. Its efficiency is 80 per cent, and the constructor calculates that it will be possible to build machines of the same type giving from 60 to 80 kilowatts for frequencies up to 100,000 and over.

M. Deperdussin, the well-known French aeroplane builder, plans to ship four of his flying machines to America with the intention of opening an aviation school here.



A tank train as it appears from the roof of the caboose at the tail end, is shown in the accompanying illustration. The tank cars contain water hauled from Willard, New Mexico, to Vaughn for railroad use.



Bags of Sand and Cement in Place of People: Testing the Balconies of a New Theater in Colorado Springs

TESTING THE BALCONIES OF A THEATER

A novel and thorough test of the carrying capacity of the balconies of a new theater in Colorado Springs, Colo., was made in September. Sacks of sand and cement having a total weight of 212,000 lb. were placed in the positions of the seats in both the first balcony and the gallery at one time, each balcony seat being tested

to 420 lb., and each gallery seat to 200 lb. The weight was four times that required by the city ordinance and far in excess of that which the theater could possibly accommodate in people, yet it resulted in a deflection of less than $\frac{1}{8}$ in. in the center.

Both the first balcony and the gallery have a span of 85 ft. and are of cantilever construction, having no intermediate supports. The theater cost \$300,000.

RADIUM BUILDING FOR PARIS UNIVERSITY

A specially constructed building has been erected for the University of Paris, at Sorbonne, for use as a radium laboratory. The walls of the building are lined on the inside with heavy plates of lead, which metal is almost entirely impervious to the radium emanations. Madame Curie will be the head of the radium department. As a coincidence, probably intentional, the building is located on the Rue (street) Pierre Curie, so named after her deceased husband and co-discoverer of radium.

ANTI-SEASICK CHAIR

An Englishman has invented an anti-seasick chair for use on shipboard. Instead of legs it is supported on pivots, so that the user remains undisturbed,

no matter how violently the vessel may roll or pitch. It is claimed that exhaustive trials have proved its practicability.



This Chair, Designed to Do Away with Seasickness, is Mounted on Pivots Instead of Legs

SAN FRANCISCO HAS GIANT WINDMILL

The Dutch windmill recently completed in Golden Gate Park, San Fran-



The Giant Dutch Windmill in Golden Gate Park, San Francisco

cisco, is said to be the largest windmill of its kind in the world, not even excepting those in Holland. Its height is 86 ft., the giant wings have a radius of 57 ft., and its capacity in a 30-mile breeze is 70,000 gal. of water per hour, pumped through a 12-in. pipe line to a distance of two miles and a height of 200 ft.

The cost of the mill was \$25,000, all of which was donated by leading citizens of San Francisco.

CALCUTTA HAS "HOLY PERFUME" BOX

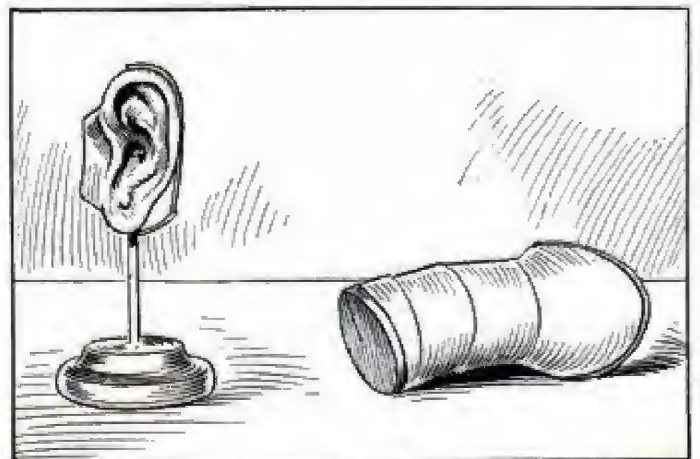
Reports from Calcutta tell of one of the most extraordinary religious hoaxes ever recorded in India. It seems that a pool of stagnant water in the northern part of Calcutta, formed from the accumulation of sewage from

roadside drains, suddenly began to emit a perfume which had a lemon flavor. Many people visited the pool, and the rumor spread that the pool was holy and that a new redeemer of the world would soon rise from it. According to reports, the pool became a place of pilgrimage. Diseased people bathed in it and drank it, and those of uneasy conscience washed away their sins in it. The water was carried away in all kinds of small vessels, and a brisk trade sprang up.

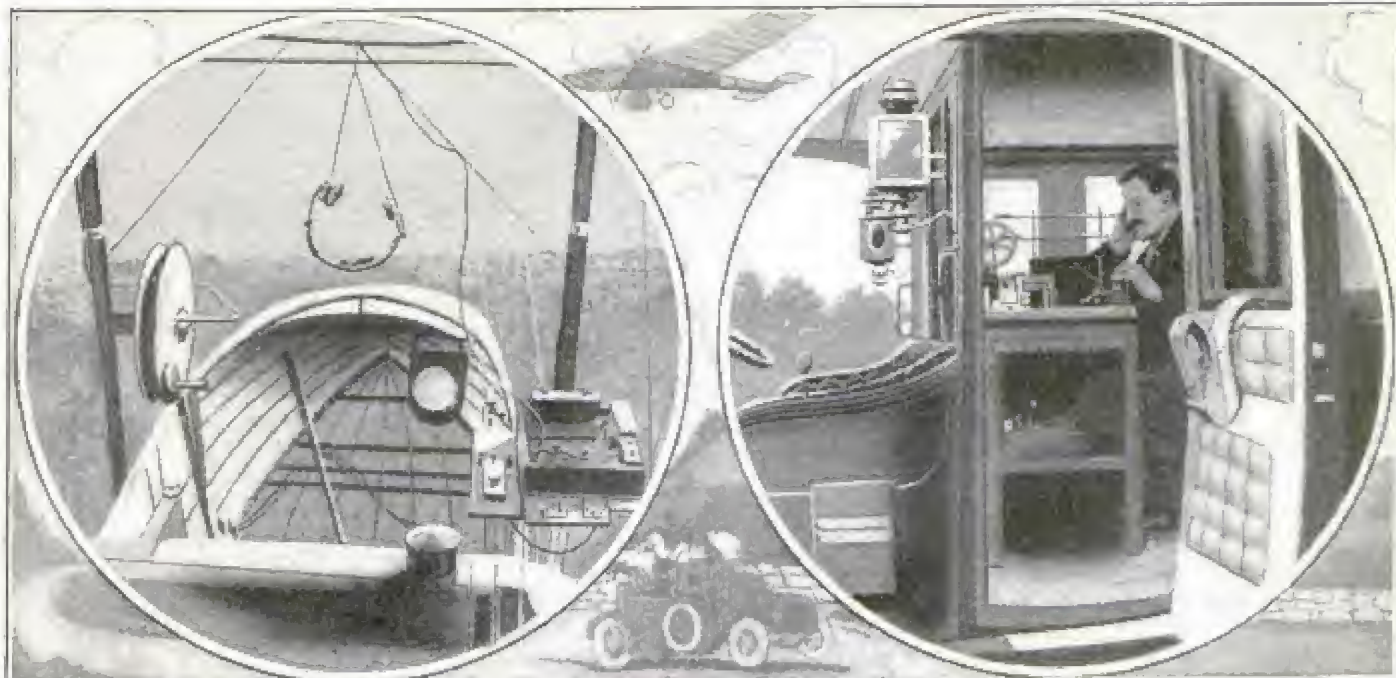
News of the holy perfume at last came to the ears of a firm of scent manufacturers, who took a professional interest in the matter and sent experts to investigate. These experts, so the story goes, soon discovered in the perfumed pool a clew to the mysterious disappearance of several cases of essential oils belonging to the scent manufacturers. Further examination showed that broken bottles of the oils had been thrown into the pool, and a young Bengalee, who had prospered through selling the holy water, suddenly disappeared.

THE FIRST TELEPHONE

Although Alexander Bell is generally accepted as the inventor of the telephone, 1876, records show that the idea of talking at a distance by means of electricity was worked upon by Philip Reis in 1861. This scientist made his receiver in the form of the human ear, and the mouthpiece had an end covered with gold-beater's skin.



Telephone Receiver and Mouthpiece Invented in 1861



The Wireless Equipment of One of the French Army Aeroplanes

Automobile Fitted with Wireless Receiving Apparatus

WIRELESS FROM AEROPLANE TO MOTOR CAR

French aeroplane officers have succeeded in maintaining wireless communication between an aeroplane in flight and a motor car in motion, as well as with the Eiffel-tower wireless station. The greatest distance covered

by the messages sent from the aeroplane while traveling at a high rate of speed was 35 miles. The installation on the aeroplane weighs 45 lb., a 130-yd. coil of wire on a revolving drum acting as the antenna. No difficulty is experienced in getting a powerful spark. Messages were sent when the aeroplane was flying 1,500 ft. high.



THE HORSE, LIKE THE BUFFALO, IS DISAPPEARING FROM THE PLAINS

This photograph shows how the auto is superseding the horse and the mule on the prairies of the West. At the left is a traction freight wagon which is largely used for the transportation of merchandise across the prairies. Next to it is a passenger car. It has almost supplanted the livery rig, and garages are taking the place of the livery stables in plains towns. At the right is a traction engine, hauling a gang plow and a cook shack.



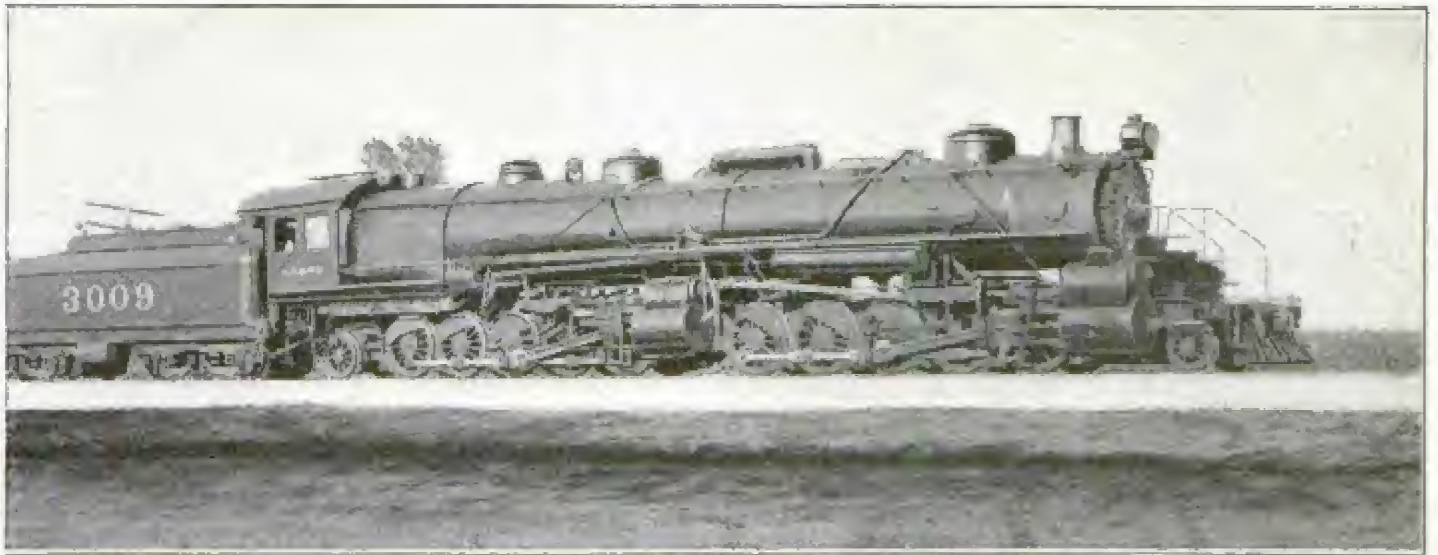
A Train Consisting of Pairs of Locomotives, Flat Cars, Coal Cars, Box Cars, Way Cars, Smokers

THIRTY YEARS' PROGRESS IN RAILROAD TRAINS

One of the most unique railway trains in the world is now making a tour of the western section of the United States for the purpose of showing people interested in transportation the great progress that has been made in rolling stock and appliances during the past 30 years. The officials of the railway system engaged in this educational work reached the conclusion that practical demonstration was a much better means of illustrating progress than literature and lectures. With this idea in view they have made up a train that includes representative types of locomotives, flat cars, box cars, coaches, etc., of 1881 and 1911. To add interest to the spectacle, for it is a spectacle, the men who operate the train, the conductor and engineer, have both been in the service of the railroad more than 30 years. They started to work when the ancient locomotive and obsolete cars on their new train represented the highest development of mechanical and engineering progress. The train is pulled from town to town along the main lines and branches of one of the biggest systems in the country and is sidetracked and exhibited to the townspeople. Representatives of the railroad explain to visitors the new

improvements and their superiority over the old.

The train is made up with one of the powerfulallet-type locomotives, the largest in the world, in front. This is followed by a locomotive of the best type known in 1881. Behind the engines are grouped the cars, in pairs, representing the two periods. The old locomotive has a weight of 133,000 lb., a relative capacity of 14,000 lb. drawbar pull, and cost \$7,740, while the weight of the new is 850,000 lb., relative capacity 110,000 lb. drawbar pull, and cost \$43,880. The old flat car weighs 19,200 lb.; its relative capacity is 40,000 lb., and its cost \$300, while the new weighs 32,110 lb., has a capacity of 80,000 lb., and cost \$943. The old coal car weighs 22,000 lb., has a capacity of 50,000 lb., and cost \$338; the new, a weight of 36,500 lb., a capacity of 80,000 lb., and cost \$1,036. The old box car weighs 22,600 lb., has a capacity of 40,000 lb., and cost \$475; the new, a weight of 46,900 lb., a capacity of 80,000 lb., and cost \$1,265. The old way car weighs 23,800 lb., and cost \$620; the new weighs 38,000 lb., and cost \$1,282. The old smoker has a weight of 49,400 lb., a capacity of 28 passengers, and cost \$3,000; the new, a weight of 119,100 lb., a capacity of



and Coaches of the Newest Type, and Showing Improvements in the Kinds Used 30 Years Ago

86 passengers, and a cost of \$12,124. The old coach weighs 50,300 lb., has a capacity of 48 passengers, and cost

\$3,605; the new weighs 123,100 lb., has a capacity of 75 passengers, and cost \$12,820.

INGENIOUS METHOD OF ADVERTISEMENT

A fair given for the benefit of a fresh-air mission in Indianapolis, Ind., was ingeniously advertised by placing a specially constructed spring-actuated cannon on a motor truck and discharging advertising cards from it while the truck was being driven through the streets. The spring was sufficiently powerful to throw the packages of cards a considerable distance, and the cards, scattered by the winds, fell in showers over the people in the streets.

SANITARY DRINKING PUMP

An ingenious adaptation of the sanitary drinking idea to the old-fashioned country pump receiving its supply of water from a well, has been made by a rural mail carrier and inventor of Oblong, Ill. Working the pump handle up and down three or four times fills the cylinder at the top. This cylinder holds a gallon of water, which flows out through the spigot and overflows the bubbling bowl. The amount of water pumped into the cylinder by the few strokes of the

handle is sufficient to keep the bowl bubbling long enough for three or four persons to drink.



Bubbling Bowl and Cylinder Convert Pump into Sanitary Fountain

ILLUMINATED BALLOONS AS AIR-WAY GUIDES

The rapidity with which flying is becoming general leads to the question



Courtesy Illustrated London News

**Illuminated Balloons Flown to Indicate the Path
Airmen Should Take**

of aerial sign posts or guides by means of which the airmen may find their way about and be warned of particular dangers at night. One suggestion is the placing of captive balloons, illuminated from the interior by means of electric lights. This idea is being experimented with in England, the captive balloons being about 8 ft. in circumference. Inside each is a 100-cp. electric lamp, receiving current through the wire holding it captive, or, as in some experiments, carrying its own accumulator. It is suggested that these illuminated balloons be used along the English coast to warn airmen that they are approaching the water, and also as aerial sign posts indicating overland routes. Different combinations of colors in the lights and in the manner of grouping the

balloons could be utilized to designate the different cities and towns and to draw the airmen's attention to special dangers.

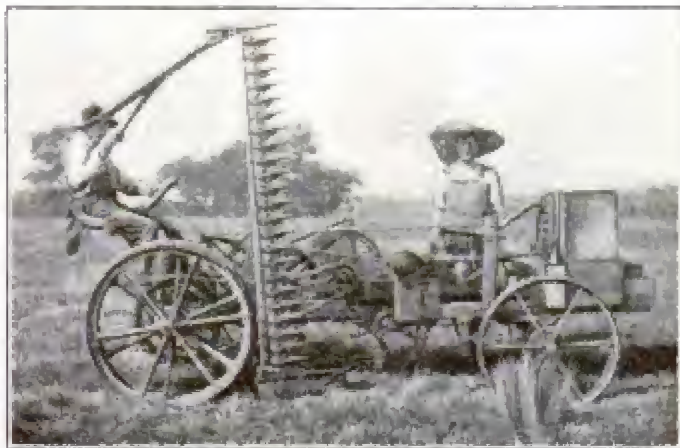
QUESTION OF STABILITY IN AIR

Two members of the British Association for the Advancement of Science announced at a recent meeting of the association their belief that the obtaining of automatic stability of aeroplanes is practically impossible. Professor Petavel, in fact, went so far as to state that he does not think automatic stability necessary or even desirable. The tricycle, for instance, is stable, and the bicycle unstable, but almost all riders prefer the latter, and he believes that mechanism for assuring automatic stability in the air would probably be dangerous in other ways. Sir William White declared he had an instinctive distrust in automatic appliances.

HOME-MADE MOTOR MOWER

A farmer near Antioch, Tenn., is using a motor mowing machine constructed by himself out of old machines, the only new part being a 2-cylinder, 8-hp. gasoline engine of the marine type. Sprockets, chains, etc., were taken from old wheat and corn binders.

The mower is driven by a 13-year-old boy, and at ordinary speed cuts a little faster than a team of horses.



Motor Mowing Machine Made of Old Mower, an 8-Hp. Marine Motor, and Various Parts Taken from Old Wheat and Corn Binders



A Motor-Truck Which Dispenses Organ Music as It Glides along the Streets

AN AUTOMOBILE ORGAN

This unique automobile street organ is now being operated by a Philadelphia bread concern as an advertisement. The organ, which is operated by the engine that drives the truck,

is played while the machine runs at a slow rate of speed up and down the streets. A large number of colored incandescent lamps make the machine an attractive display at night.

TRAINING THE OSTRICH TO RACE

Racing ostriches against horses is not by any means a new sport, but to go into it as a business is a little un-

usual. A breeder of ostriches in Florida makes a specialty of training the big birds to trot in sulkies, and makes



A Race between Two Ostriches at a County Fair; the Big Birds are Usually Raced Against Horses

numerous engagements to race them against trotters at county fairs, having several racing ostriches in different



The Ostriches are Kept Hooded until the Moment of the Race

parts of the country at the same time. A hood is placed over the head of the ostrich while it is being harnessed and it is not taken off until everything is completed and ready.

GRUESOME SIXTEENTH-CENTURY WATCH

This ancient watch, the case of which was made in the form of a skull, is credited to the workmanship of Sieur Mayse, a watchmaker who



Gruesome Watch of Four Hundred Years Ago

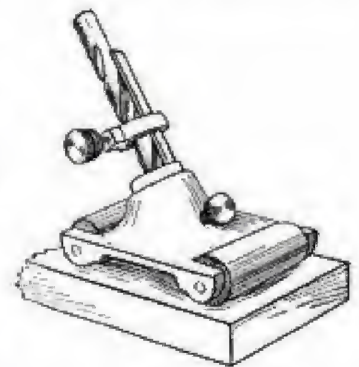
did much work for Queen Mary of Scotland. It is elaborately engraved with various symbolic figures and

biblical scenes. On the forehead is Death, with the scythe and hour-glass. On the left side is a scene in which Eve is smiling and offering the apple to Adam, who is represented as rather hesitating, while the serpent seems to whisper into his ear. The creation of Eve is depicted on the left side, the Deity, in the guise of an earthly king, presenting her to Adam. In order to read the time it is necessary to open the jaws, within which the dial is placed.

BRITISH DRILL WHET

A new and effective tool by means of which drills may be easily and accurately ground has recently been introduced in England. The device is used on any flat whetstone or on an emery board, and is said to produce an absolute pair of fine cutting lips on any drill from $\frac{1}{16}$ to $\frac{5}{16}$ -in. diameter.

The operation of the device is simple, the drill being clamped in the holder, with the point projecting about half an inch. The holder is then inserted in the carriage, with the feed-screw point in one of the slots, lowered until the drill rests on the stone, and then grinding is commenced by rolling the carriage back and forth on the stone, the feed screw being turned as required. To grind the second edge, it is only necessary to lift and reverse the holder, taking care not to lift the feed screw, then grind until contact finishes.



Electric power is utilized almost entirely for sheep shearing and milking cows in New Zealand where the development of the use of current in the home and on the farm has outstripped its adoption in the wider fields of mechanical power.



Bringing Down a Balloon with New Rifle

A Rifle Designed to Fire Balloons

The Flaming Gas Bag Brought to Ground

RIFLE DESIGNED TO FIRE DIRIGIBLES

The fact that the ordinary rifle bullet will pierce the bags or gas envelopes of ordinary spherical balloons and dirigibles and pass through without doing much damage has resulted in a rifle whose projectile will ignite the

gas and bring the balloons flaming to earth. The projectile is a bullet of special construction.

The accompanying illustrations show the manner of using the rifle and the result.

ARMORED MOTORBOATS FOR TURKEY

A motorboat concern in England is building 22 armored motorboats which Turkey will use as patrol boats on the Red Sea, Persian Gulf and Mediterranean. They are 60 ft. long, have a breadth of 11 ft., and a draft of only 2½ ft., making shallow river work

possible. The speed is about 13 miles an hour. The hulls are protected against rifle bullets by means of a belt of bullet-proof nickel steel extending from the aft end of the after cabin to the forward end of the motor room, and from the water line to the deck.



One of the 22 Armored Motorboats Ordered by the Turkish Government

The wheel house is provided with circular brass-framed deadlights with armored plugs having sight holes. The cabins are covered with nickel steel,

bullet-proof at 60 deg. Two quick-firing guns are carried by each boat, one on the forward and the other on the after deck.

BUDAPEST BANK HAS SLOT-MACHINE DEPOSITORIES

Slot machines as depositories for savings have been found by a Budapest banking concern to be an excel-



Banking Savings through the Medium of Slot Machines, Which Deliver Receipts That may be Collected or Exchanged Against a Bank Book

lent means of increasing the amount of money handled by its savings department. The slot machines are placed in the street, and the persons placing money in them are automatically given a receipt, which may be exchanged against a bank book, or kept until such time as the receiver is desirous of withdrawing the deposit from the bank.

The idea is that people will deposit small amounts, if relieved of the necessity of going to the bank to do so, and also that the sight of the machines will cause them to deposit coins within

instead of spending them. It is said that the deposits of the bank have shown a remarkable increase since the idea was instituted.

KNOWLEDGE OF ORE MOUNTAIN TRADED FOR DOG

The contemplated purchase by an American corporation of a copper mountain on Prince of Wales Island, Alaska, for \$2,250,000, recalls the story of how the knowledge of this mountain, said to be one of the largest single bodies of copper ore in the world, was bought for a yellow dog.

A number of years ago a representative of English capitalists was "stalled" for the winter at Fort Yukon, and there met an old Alaskan prospector who was seeking a "grubstake," and particularly a dog. When this prospector learned that the representative of English capital was looking for iron and copper he bargained to show him a great mountain of the ore in consideration for one good dog. The mountain, according to the prospector, had been worked by Russians in the days when the flag of that country flew over Alaska, and several shiploads of ore had been carried away. The prospector got the desired dog, but lost his life while hunting for game. The English representative, however, did not forget the story and later induced his backers to invest sufficient money to pay the expense of finding it. A search of old Russian records revealed an account of the voyages of the Russian ship and the latitude and longitude of the mountain.

¶ Sarah Bernhardt, the great French actress, has appeared in a moving-picture play made up from her arrangement of the play "Camille."

The Secret Experiments

of the Wright Brothers

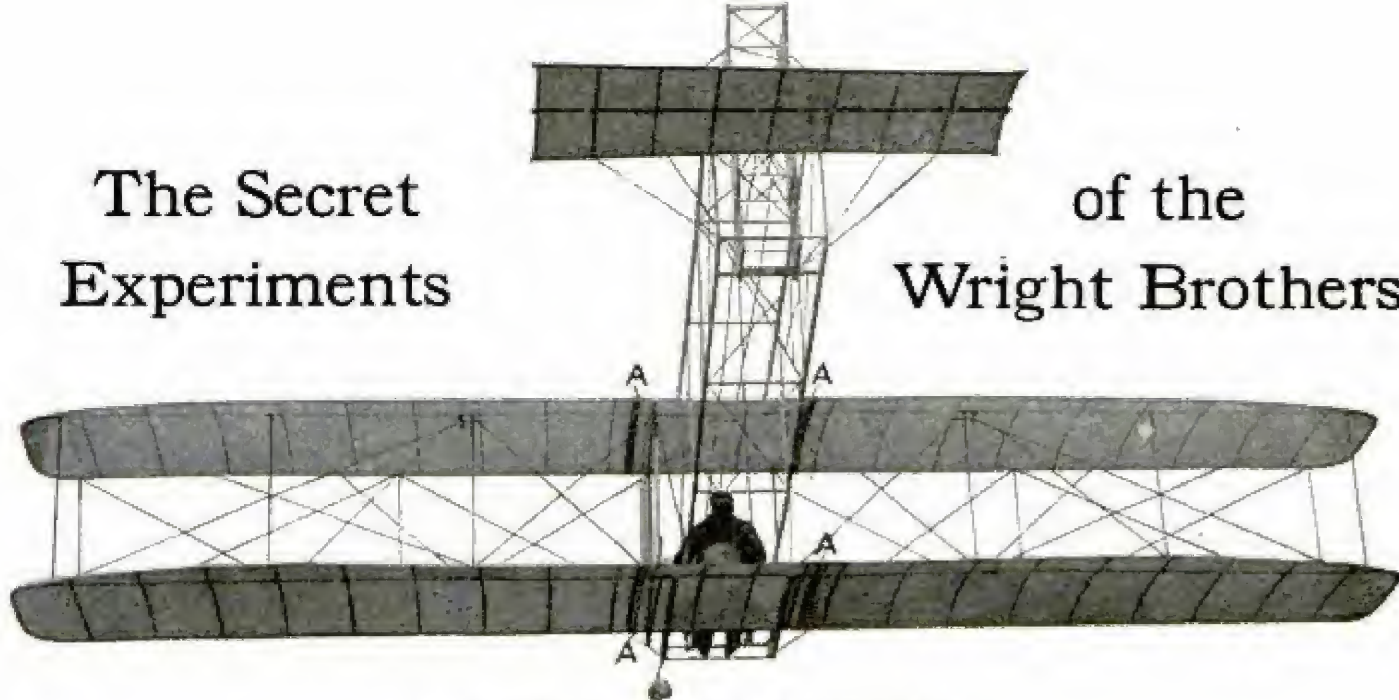


Fig. 1—View of Wright Glider from Below

SO many extravagant stories have been printed concerning the interesting experiments with a new glider, which the Wright brothers have been making of late at Kill Devil Hills, N. C., that Popular Mechanics Magazine sent an acknowledged authority on aviation to North Carolina to write an accurate and complete description of the machine and of results secured, together with an expert analysis of the technical significance of the work.

DESPITE the wild tales that have been filling the newspapers of late, to the effect that the new Wright machine was a flapping-wing device, that it was a solution of the problem of flight without power, that it was capable of hovering indefinitely over a selected spot, and that it was capable of imitating the soaring flight of the larger birds, it proves upon first-hand investigation to be only slightly different in appearance and performance from previous Wright gliders and power machines—over which it discloses improvement only in immaterial and minor degree, if at all. Probably the Wrights themselves would claim little more for it, though their customary reticence has been in this case, as before, taken as evidence of mysterious and marvelous achievements—by newspaper writers with more interest and enthusiasm than technical competence.

Undoubtedly this attitude on the part of press and public has been inspired largely by the vague but not ill-founded idea that soaring flight with aeroplanes, with use of power only occasionally, if at all, is an im-

pending development in this field of engineering. And while it is not the fact that the Wrights have really achieved such flight in the present experiments, they have unquestionably made a greater or less step toward it; and that still greater progress will be made in the near future by them or by others is not to be doubted.

To those who were so fortunate as to see the flights with the new glider, even to the technical experts who have some idea how they are accomplished, it was nevertheless little short of miraculous to observe the Wright structure of wood, wire and canvas, apparently under the absolute control of the operator, with no visible source of power, perform its amazing feats. To see it poise itself for seconds, even minutes, at a time, apparently in defiance of the law of gravitation, then advance steadily into the teeth of a driving gale, which by all that seemed reasonable, should have driven it backward; again, finally, to see it lose ground, back up, and settle with hardly a tremor, at the starting point, had all the seeming of something miraculous.



Orville Wright Making Observations during the Trials with the New Glider

At other times in the course of the trials, a most pretty sight was the extreme manipulation of the wing warping to balance the frail craft as it hung suspended in the invisible medium that so securely supported it. And, again, there were graceful, swooping maneuvers and hair-raising dives, by which the younger Wright brother exhibited his seemingly complete mastery over the element that from the beginning of time has been regarded as the particular realm of the creatures of the air, with whose dominion of the atmospheric ocean it was so long supposed mankind could not hope to dispute.

The crux of the problem, as hereinafter suggested, is the utmost possible flattening of the gliding angle together with the greatest possible development of the "tangential," as the obvious means of preventing loss of height even when only very slight rising currents are available. Using this condition as a test of the newest

Wright experiments, there can be no question but what in their new glider they have secured a somewhat greater flattening of the gliding angle than has been achieved by any other constructor. But that it is very materially flatter in the case of the new Wright glider, or anywhere near as flat as in the birds, is a claim that does not appear tenable. Nevertheless, it is, in a sense, of all the greater significance that, with so slight a degree of improvement, it should become possible to make such remarkable hovering and rising flights into strong winds as have been made by the Wrights with their new machine.

The Kill Devil Hills were made famous by the classic original gliding experiments of the Wright brothers, which culminated in a short but successful flight with a power machine late in 1903. In many respects the place is ideal for the purpose, its remoteness and inaccessibility precluding all possibility of spectators numerous enough to be troublesome, while the high sand dunes and the sandy flats afford excellent places for starting and safe places for landing. In addition to these requisites, the prevalence of steady winds of ample velocity throughout considerable portions of the year peculiarly adapt the locality to gliding experiments of the character under consideration. It is said that the Kill Devil Hills were originally recommended to the Wrights by Langley, and were promptly chosen as the site of their first work, after a brief correspondence with the nearest postmaster.

The Hills are a group of shifting sand dunes, ranging up to a possible maximum of 100 ft. in height, rising from the almost uniformly barren surface of a long, low, and narrow sand spit that extends southward along the North Carolina coast from Cape Henry to the entrance of Albemarle Sound. The island is nowhere more than about a mile and a half wide. The nearest point on a railway is Elizabeth City, N. C. From here a daily



Fig. 2—Orville Wright Seated in the Glider—A, Joints in Wing Surfaces; B, Vertical Fin; C, Adjustable Weight for Balancing

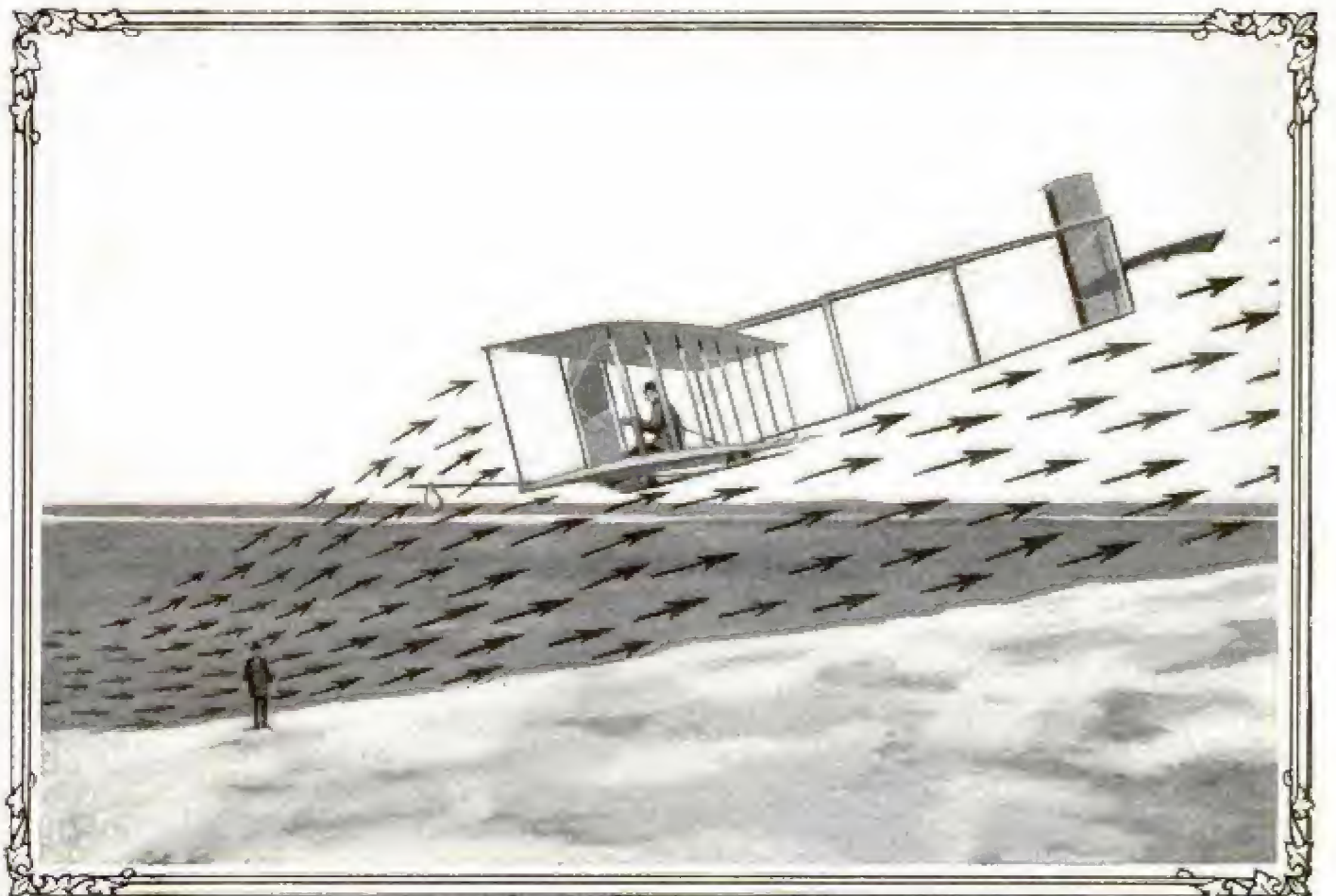


Fig. 3—Arrows Indicate 50-Mile Wind, Showing How Machine Was Sustained in a Stationary Position

boat covers in five or six hours the 50 miles to Nag's Head, a fishing settlement some 5 miles south of the Kill Devil Hills, and to Manteo, a village of 500 population across the sound on Roanoke Island—noted for its important part in the early settlement of the North American continent. Kitty Hawk, another small village, is six miles north of the Kill Devil Hills, and can be intermittently reached by a mail boat.

The new glider is a characteristic Wright biplane, with a span of 32 and a chord of $5\frac{1}{2}$ ft. Its weight is about 145 lb. The wings are said, and appear, to be identical with those of one of the standard Wright power machines, and are correspondingly thin, and flat in curvature. The two surfaces are separated by eight pairs of vertical struts, no different from those long employed in Wright aeroplanes, which space off the total span into seven sections. As heretofore, the center section is made narrower than the others, and for convenience in shipping is made readily separable from the portions on either side of it. The junctures in the wing surfaces are very apparent at AAAA, Figs. 1 and 2. The operator is seated directly in the middle of the machine, on the forward edge of the lower plane.

The center section and the two first sections on either side of it are rigidly trussed in all directions by diagonal bracing wires, leaving the first two sections from each wing tip free to undergo the distortion involved in the wing warping. This is accomplished, as is clearly shown in Fig. 2, by identically the same elements that have been employed for the same purposes in all Wright aeroplanes for at least a year or two past. Thus the wing warping and the double vertical rudder are worked by a lever with a jointed head, placed at the right of the operator, while the elevator is worked by the lever at the left.

Unlike previous Wright gliders, but like all recent Wright power machines, the single flexible elevator surface is

placed at the rear. A square-ended tail surface is illustrated only because one of standard form that was available became broken in an accident.

Both vertical and horizontal tail surfaces are carried on a light skeleton box girder similar to that used on the power machine.

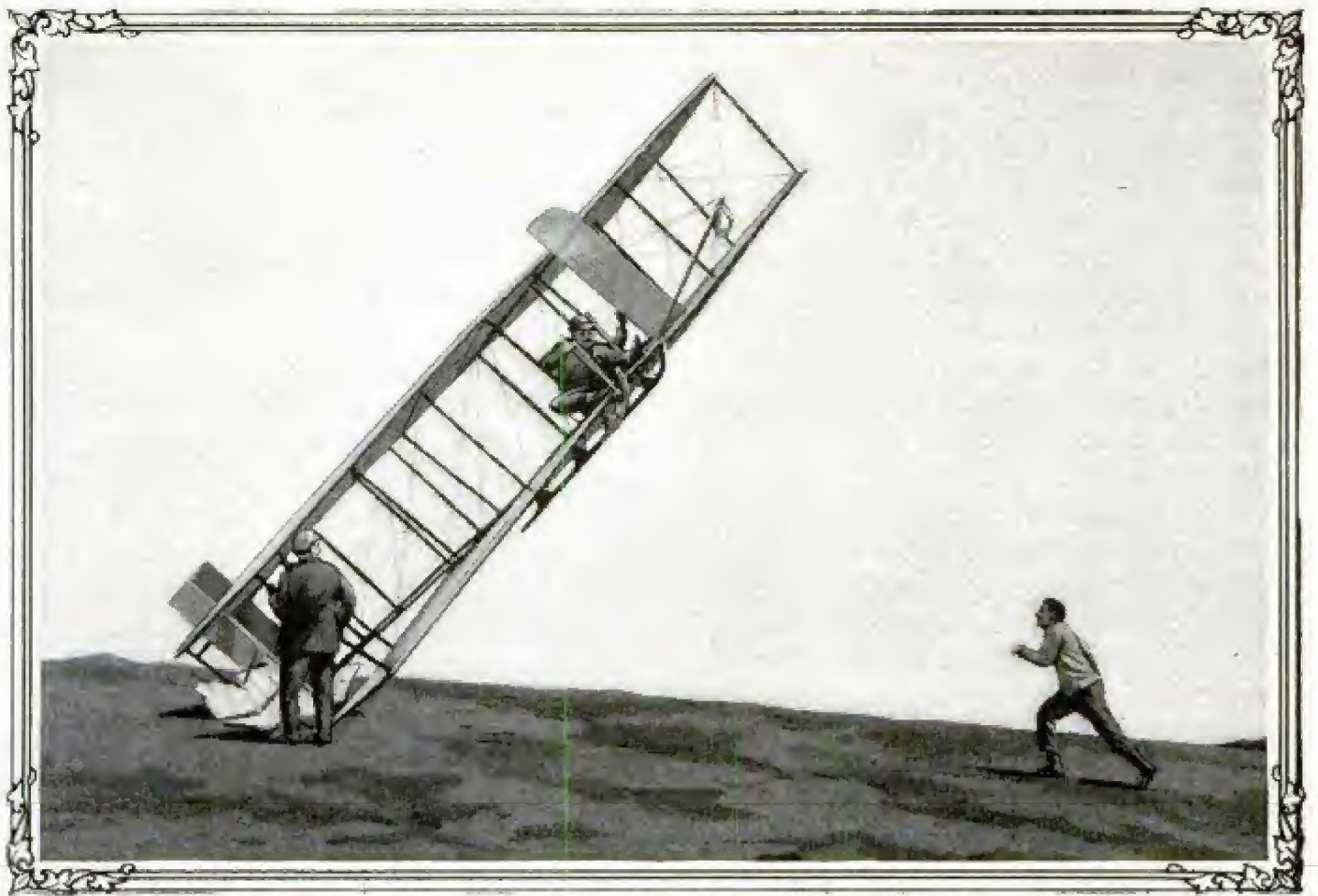
A curious-appearing feature is the single vertical fin, about a foot wide, which extends the entire height of the machine just in front of the main planes, and to the left of the operator. This is, however, simply an equivalent of the fin-like "blinkers," similarly present in all but the very earliest Wright biplanes.

The runners resemble those on early gliders, being much lower than are now used on the power machines. They are, indeed, barely sufficient to keep the lower plane off the ground. Presumably the design of this detail is dictated by a desire to secure the utmost minimization of the head resistance.

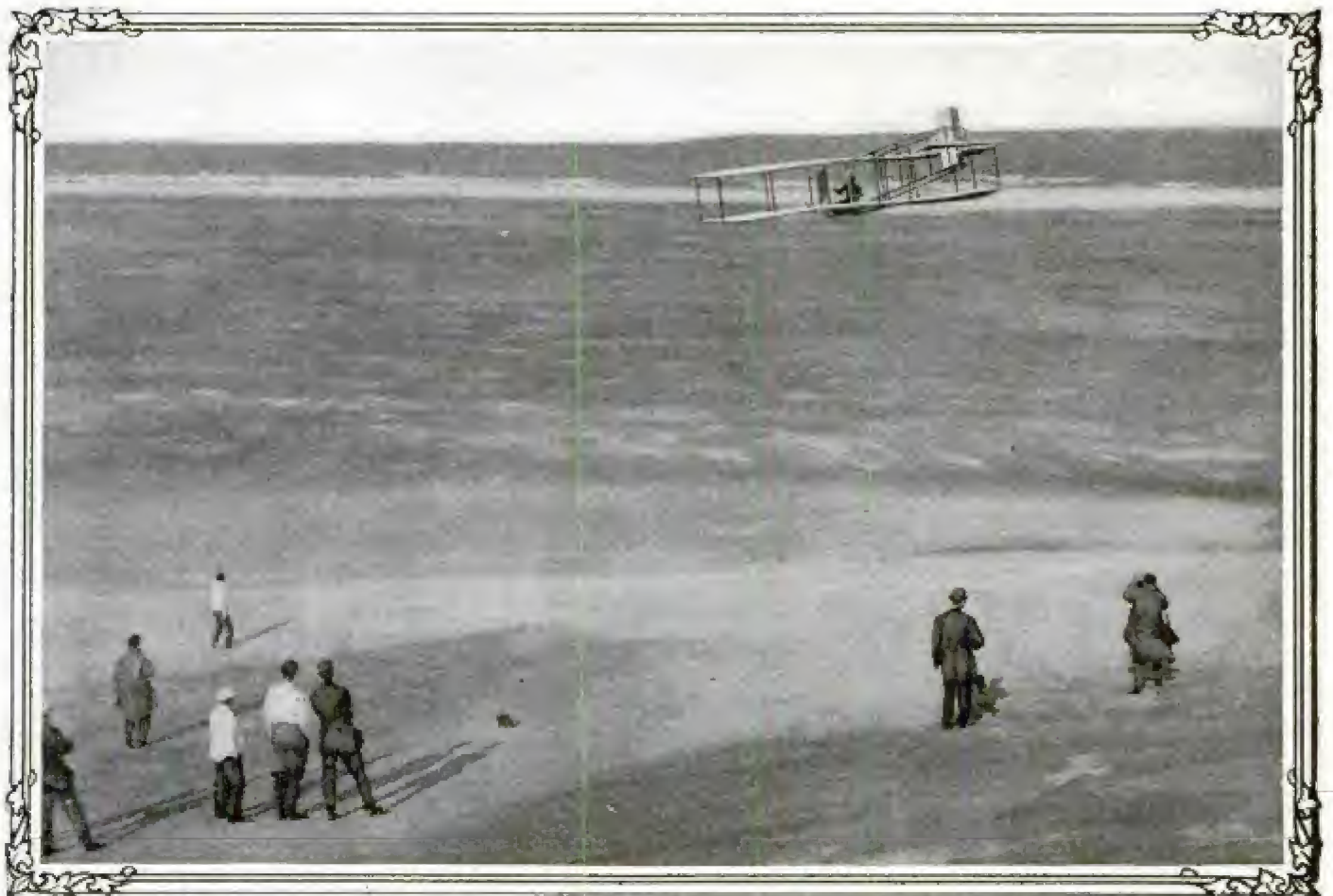
For securing very exact adjustment of the longitudinal balance of this experimental glider, there is outriggered in front a boom (C, Fig. 2), to which there is attached a weight that can be conveniently varied in quantity or shifted in position.

The glider has been tested by releasing it from a hilltop into winds ranging up to 50 miles an hour, in the manner sketched in Fig. 3, every condition being especially selected to secure the utmost possible advantage from the strongly-rising wind, as it is deflected upward by the slope of the hill, in the manner indicated by the arrows. It is a well-understood effect of sloping ground that it upwardly deflects wind flowing over it.

The results secured were quite what would be expected. At times, when the balance between the normal gliding speed of the machine and the velocity of the wind happened to be just right, the aeroplane would poise itself in a maintained position over the ground, without advancing or receding. On one occasion it thus hovered for



An Accident Which Broke the Rudder—Warping of Wings in Attempt to Control Glider is Noticeable



The Aeroplane Hovering in a Wind. Note How the Coats of the Spectators are Blown Back, and the Clearly Evident Distortion Due to the Wing Warping

about ten minutes. At other times it would rise or fall without horizontal displacement, and then again it would drift back or glide ahead, as fluctuations in the wind facilitated these maneuvers. At all times it exhibited the positiveness and certainty of control, for steering, balancing, and landing, which is a feature of the Wright power machines—and, indeed, of many others. Yet, that the performance was not as wholly new as it has been heralded, except in the degree of its accomplishment, is attested in the Wrights' own reports of their first gliding experiments, communicated to the Smithsonian Institute and to the Western Society of Engineers, in which there is mention of brief hovering and gain of height in winds blowing up sloping ground.

It is a curious feature of these experiments, and of the many misstatements that have been made concerning them—wholly without the approval of the Wrights, of course—that the average mind finds it so difficult to visualize the phenomena that affect an aeroplane in a wind. To begin with, there is not the distinction that is commonly assumed between gliding with a motorless aeroplane and gliding with a motor aeroplane with the motor stopped—the latter the "*vol plane*" of accepted aviation terminology. Wherefore the record for gliding flight logically belongs, in all reasonableness, to whomsoever has accomplished the longest *vol plane*, rather than to some one who may have made a shorter glide with no motor in his machine instead of with the motor merely stopped.

About the matter of hovering other misconceptions are rife. It is well understood that to secure sustentation from the air, an aeroplane must be in continuous lateral* movement, but what seems not to be so well understood is the fact that this lateral movement requires only to be *through the air*, and sustains only a most incidental relation to the ground. The consequence is that if the whole body of the air is

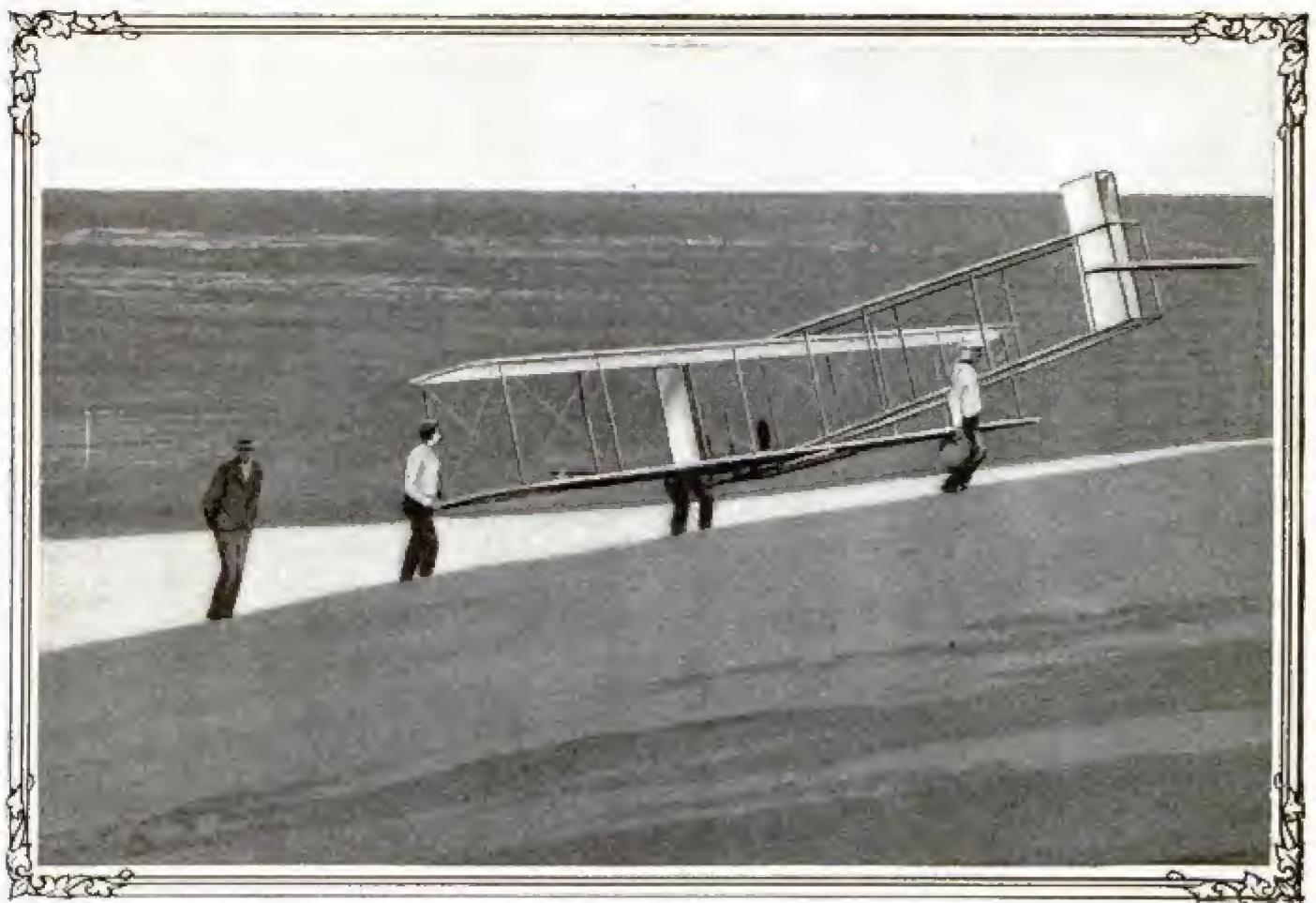
drifting, in the form of a wind, across the earth's surface at a speed, say, of 50 miles an hour, an aeroplane running into this wind at 50 miles an hour will be normally sustained without making any progress over the ground whatever—in other words, while hovering. But relatively to the air that sustains it, it will be moving normally. Conversely, if the aeroplane turn and travel *with* the wind, in securing sustentation at its normal speed there will be added to this the wind speed, combining to make a speed over the ground of 100 miles an hour, despite the fact that it is moving *through the air* just 50 miles an hour, as before. The condition may be likened to that of a fly in a railway coach, moving about unconscious of the fact that the body of air in which he flies is moving rapidly over the earth's surface. Another analogy is the case of a steamer forging against a rapid river current, and making speed in respect to the water, but little or none with reference to the banks of the stream.

Of course the extreme conditions, of complete doubling or nullification by wind of an aeroplane's speed, are unusual, but less extreme conditions, involving the same principle, are common to all aeroplane flights not undertaken in a dead calm, and in which there are all degrees of minor additions to or subtractions from the actual speed of the vehicle by the effect of winds. And in at least one recent instance, which was observed at an English flying ground, a power-driven aeroplane was seen to hover for some seconds when its own speed and that of the wind happened for a moment to coincide.

In ordinary gliding, as distinguished from flight with a motor, some source of power is just as necessary as in the other case, the only essential difference being that gravity now supplies the energy by the simple process of compelling the machine to lose height. An automobile does not need a motor to coast down hill.

Further to clarify these explana-

* The word "lateral" is now being used by aeronautic writers in the sense of horizontal movement forward.



The Glider being Carried Up the Hill for Another Trial



Another View of the Machine Hovering. Note the Extreme Use of the Wing Warping

tions, it may be well to emphasize a few points that are more obscure. First is the fact that any wing surface, at a fixed angle and with a constant loading, has a certain critical speed at which it is normal for it to travel, and at which the resistances it opposes to movement through the air are a certain fixed percentage of its weight—the "lift and drift ratio" of the engineers. To overcome the drift resistances, it is necessary either to provide propeller thrust of corresponding magnitude or else to resolve the weight of the machine itself into a propelling component, by coasting it downhill in the air, so to speak.

With an understanding of the foregoing, several matters become clear. At once it is evident that a most important field for aeroplane development lies in the direction of improving the lift-to-drift ratio—in a glider, flattening the angle of coasting necessary to sustain the craft, and in a power machine, reducing the measure of propeller thrust and horsepower required. A less evident, but not less real advantage of flattening the gliding angle inheres in the possibility it opens up of taking extensive advantage of rising currents in the atmosphere as means of propelling aeroplanes, for such currents, while common, are not ordinarily of sufficient magnitude to sustain machines of such excessively abrupt gliding angles as are now almost universal.

In thus taking advantage of rising

currents, after much the same manner that is probably employed by the soaring birds, the particular essential always must be a gliding angle so flat that the machine loses altitude slower than the air rises, thus continuing indefinitely to coast down an invisible hill that rises faster than the vehicle slides down it.

Despite their unwillingness to make premature announcement of their opinions or plans, it is safe to infer that something of the foregoing is what the Wrights have had in view. To secure results, however, they have seen fit to commence by working in exceptionally vigorous rising winds, in preference to depending upon any prospect of securing exceedingly flat gliding angles.

The "automatic balancing," concerning which the daily newspapers had much to say, was not tried out. It is understood, however, to have contemplated only a test of the long-patented but little-exploited pneumatic and other devices the Wrights have proposed for this purpose. It is also asserted that the present plan is to balance automatically by ailerons hinged to the wings, so that the normal hand control by warping will not be interfered with. Presumably the policy in this is to avoid depriving the operator of the normal manual safeguards while the automatic device is tried out, rather than to substitute permanently the ailerons for the, in every respect, more effective wing warping.

ASHEVILLE, N. C., AS A HEALTH RESORT

In the ninth of the series of articles on "The Kingdom of Dust," which appeared in the October issue, the following statement was made:

"Unfortunately, the chosen places of the earth, climatically speaking, such as Denver, and Asheville, where the natural conditions are most favorable for patients suffering from tuberculosis, have become hotbeds for the growth and dissemination of the disease."

Dr. L. B. McBrayer, Health Officer of Asheville, N. C., takes issue with the author of the article. He declares that Asheville takes every known precaution to prevent the dissemination of tuberculosis. While it is undoubtedly true that the congregation of persons afflicted with a communicable disease will spread that disease unless rigid sanitary precautions are taken, and while a few

years ago a theory was held by physicians which would have warranted the assertion made in the article, it is recognized that most well-established sanitariums and resorts are now actually freer from bacilli than the ordinary factory or home where an unsuspected case may exist or where a careless patient works or lives.

The Asheville Health Department is active and efficient in carrying out its laws for the prevention of tuberculosis. A recent bulletin of the department begins with the following statement:

"Asheville opens wide her doors to the sick and well from every clime, but she demands that the sick shall so comport themselves that they shall not become a menace to the health of her citizens or the stranger within her gates."

COMMENT AND REVIEW

**Climatic
as an
Asset**

ON no other continent, under no other sun, in no other zone, in all this world, can be found the same extent of fertile, available agricultural land, as in these United States. And in no other equally large tract as that stretching from the Atlantic to the Pacific, and between the Great Lakes and the Gulf, can be duplicated the same amount of normally good weather, as Nature has bestowed on this favored land. Our rain and sunshine are so proportioned the one to the other as to produce the best yearly conditions on earth. Africa has its jungle, Australia its vast desert, Siberia its endless wastes. For weeks or months at a time the inhabitants of other countries must be content simply to wait until the passing of the inclement period before resuming anything like their full measure of activities. In one place it is the long winter with deep snow and short daylight; in another, a season of unhealthful heat or rain, from each of which the people emerge with mental and physical powers at a low ebb. But here our North is not so cold, nor our South so hot, as to preclude a continuous season of activity. In every part of the land our railroads are running throughout the year; our children can reach their schools; our stores and banks and factories and mines are in operation every week day; we are a continuously busy and employed people.

And all this is possible because we have a maximum of good weather. Our climate is an asset we seldom reckon.



**English
Post Office
Profitable**

THE report of the post office department for the United Kingdom for the fiscal year, shows a profit of \$21,000,000, and this moreover after paying a loss of \$5,500,000 for telegraph deficit, and another loss of \$200,000 on its telephone department. In Great Britain all the commercial telegraph business, and most of the telephone service is operated by the government. While it is true that the wages of postal employes there are very much lower than here, and the average distance a letter is carried is less than in the United States, yet the domestic letter rate is but one cent of our money. Moreover, a large parcel-post business is handled, amounting to over five billion pieces, while there were only three billion letters. Over one billion packages were carried for a half-penny, or one cent of our money, each.

In view of the fact that the English are not as voluminous letter writers for business and social purposes as the Americans, and that the parcel rate is low there and high here, it would seem as if our own postal department might be able to so manage its affairs as to avoid any loss without increasing the rate of postage on any class of matter, and to establish a parcel-post rate which would serve the people without involving any loss in doing so. Thousands of small shop keepers in London, for example, have no other means of delivering purchases. You step into a store on the Strand and buy a book, a hairbrush, a box of cigars, and the parcels post gets it out to your residence six or eight

miles distant almost as quickly as you get there yourself. It is the salvation of the shop keeper in the small towns, who can order goods he cannot afford to "stock" and get what his customer wants, quickly and at the cost of one or two cents, or less, for postage. The country dealer in fighting the parcels post, especially as proposed as local on rural routes only, is fighting his own best friend, although he does not know it. He has not made its acquaintance, and fails to comprehend his own possible opportunities.

Not a hundred miles from Chicago is a town of about 3,500 people. Ten years ago many of its merchants bitterly opposed the construction of an electric line between that place and a little hamlet of perhaps 100 people, 10 miles distant. It was argued the new road would build up another town and all the farmer trade in that section would be lost. The line was built, the little hamlet has grown to a town of more than 1,000 inhabitants, with waterworks, electric lights, telephone exchange, fire department and all that; and the trade from that section with the old and large town never was, and never would have been, anything like what it is today, but for the road. Transportation facilities, —and facility includes a reasonable cost of service—create business. A parcels post will do the same.



IN his dedication of the Naval Training School at Lake Bluff recently, the President took occasion to emphasize the radically changed conditions which in the modern fighting ship have replaced such characters as the

*Industrial
Character
of Navy*

"Brave Old Salt," with educated engineers and mechanics. This explains the location of the finest naval training plant in the world on the shore of an unfortified, fresh-water lake, a thousand miles from salt water. Heretofore the young men went to the Atlantic or Pacific coast to train: Now the school has come to them, for fully 46 per cent of the naval recruits come from inland states. President Taft said:

"The men who serve in the navy today are serving an apprenticeship of an industrial character that will fit them to serve well, after they have left the navy, in trades where knowledge of mechanics and electricity and other trades are necessary.

"The management of a warship today and its conduct is like the conductor of a great machine shop, and the men are required to have a higher degree of intelligence, greater manual dexterity, than the sailors of old."



ALTHOUGH the recent accident to the "Olympic" is unlikely to occur again either to itself or other ship of equal size, and while the incident was expensive, the demonstration affords a valuable test which would never have been deliberately undertaken. In the first place the

*The
"Olympic"
Accident*

lesson has been learned of the necessity of maintaining a safe distance between two vessels of such unequal size as the "Olympic" and the "Hawke"; and second, the strength of construction and consequent safety of the huge liners. The "Hawke" which struck the "Olympic" bow on, was a naval ram, with a cruel sharp-pointed bow like the pilot of a locomotive, extending many feet below the water line. This was the instrument which really did the damage and punched a hole 30 feet in diameter, below the water

line. This was the instrument which really did the damage and punched a hole 30 feet in diameter, below the water

line. The extent of this blow is appreciated when it is known the cost of repairing the "Olympic" will amount to approximately \$750,000. Damage to a big thing usually runs into big money, but on the other hand, had the "Olympic" been, say, a 20,000-ton boat and struck as she was, she would doubtless have been cut in two and proved a total loss. While the occurrence has been an expensive one to the owners, who in addition to the cost of repairs, lost several trips at a busy time of the year, there is a certain compensating value in the feeling of security which the ocean traveler will feel; for the ship was able the following day to proceed under her own steam to Belfast where her passengers were discharged and the ship put in dry dock.

The accident has proved an argument in favor of the large hull, and a lesson to small craft to give the big ones a wide berth.



ONE would hesitate to use the word "cowardly" in connection with the operation of an aeroplane: At the present progress of the art every flight is attended with peril and every airman knows it. But the man who has

***Airmen's
Greatest
Fear***

kept his head and nerve in moments of great danger, thousands of feet in air, loses his backbone and finds himself unable to face the ridicule of an unreasonable crowd who have paid their admission and insist on their pound of flesh. How often, unfortunately, the past season have these modern Shylocks won their case. A number of deaths have been unquestionably due to the aviator going up to appease the clamor of a relentless mob, when he knew he was going to almost certain death. The same men and women, the day before, had assembled at a baseball park, when the game was postponed on account of rain. Disappointed, but in an orderly manner they filed out, each accepting without expressed blame for anyone, the refund of their gate money. The same crowd would cry out in righteous indignation against the attempted racing of an obviously sick horse; many of them would climb a tall pole or tree to rescue a frightened, helpless kitten. But when they are bent on seeing an aviator in flight these same people seem to lose the last atom of compassion; and after he reaches earth, a bleeding mass, lose all sense of shame in an orgy of frenzy to secure a collar button, or a fragment of his clothes. None but barbarians would ravage even a foe fallen in battle thus. Just what are the psychological forces that produce these disgraceful cyclones of inhumanity is hard to explain, but as the officer of the law does not hesitate to use force to save the life of a would-be suicide, so some legal power will be required to protect an airman from himself, if this condition continues.

H. H. WINDSOR

IMPRESSIVE MOBILIZATION OF AMERICA'S NAVAL POWER

Practical demonstration of the preparedness of the United States navy for active service was given, Oct. 31 and Nov. 1 and 2, by the mobilization of the fleets of the Atlantic and Pacific at New York and Los Angeles, respectively. For the first time in the history of the United States, every available vessel assigned, theoretically at least, to the protection of the two long coast lines of the country were assembled and inspected by the highest officers of the land. The President and the Secretary of the Navy reviewed the Atlantic fleet at New York, and the commander-in-chief of the Pacific fleet, Rear Admiral Chauncey Thomas, was in supreme command at Los Angeles. The two reviews constituted a remarkable achievement, not alone because of the large number of vessels brought together, but because the reviews were not the result of a premeditated scheme and the officers in command of the various divisions of the two fleets were not given much time in which to prepare their vessels to the rendezvous.

The review in New York, Nov. 2, when President Taft passed through the seven-mile line of battleships, cruisers, destroyers, torpedo boats, submarines and auxiliaries, was the greatest ever held in the history of the United States navy in time of peace, and the vessels assembled probably constituted the strongest battle fleet ever seen in American waters. The review of the English navy and foreign warships at the time of the coronation of King George, last June, is the only naval event of like character that approached it in point of number of ships.

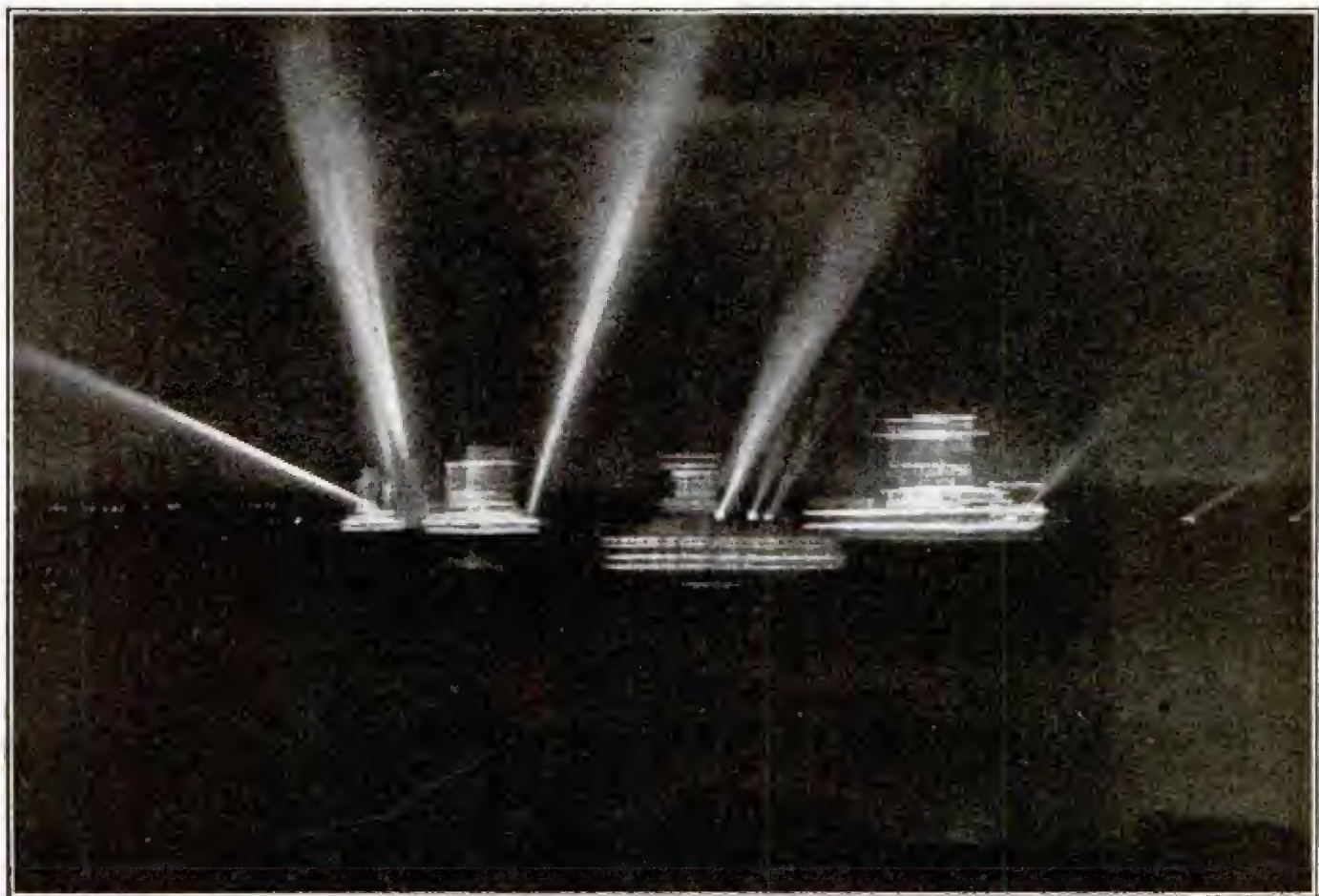
For two days the waters of the Hudson River adjacent the city of New York were filled with men-of-war of all types and sizes. Twenty-six of the battleships of the United States navy were at the head of the first of the four lines of ships, the longest of

which extended from 57th Street to Spuyten Devil, a distance of 7 miles, the entire formation including 102 ships of all classes. Every ship of the dreadnought type in commission, as well as the "Iowa," "Indiana" and "Massachusetts" of Spanish war fame, were in line, and the metropolis was shaken to its foundations by the thunder of guns as salute after salute was fired. More than 5,000 guns were fired in greeting President Taft. Secretary Meyer was honored by the discharging of some 2,000 guns, and the various division commanders received salutes from time to time as they visited the ships of the different sections of the fleet. One of the regulations regarding honors accorded persons of dignity by the military and naval services places the President of the United States in a class by himself and requires that his flag shall be saluted every time it comes in sight of a vessel or fort. The result is that every ship in the fleet provided with a saluting battery fired 21 guns in honor of Mr. Taft when he passed along the lines on the Presidential yacht "Mayflower" in the morning and then saluted again in the afternoon, when the entire fleet passed in review before the "Mayflower," which was then anchored off Tompkinsville.

ELECTRIC LIGHTING FOR AEROPLANES

A concern in Boston, manufacturing electric-lighting systems for automobiles, have announced the completion of a system designed for aeroplanes. On the biplane type of machine the headlight is placed immediately in front of the airman and is controlled by foot mechanism on the frame upon which the feet rest. The switch is attached to one of the uprights within easy reach of the airman's hands. The dynamo, which weighs 19½ lb., is placed close to the motor and is operated by either a chain or a belt.

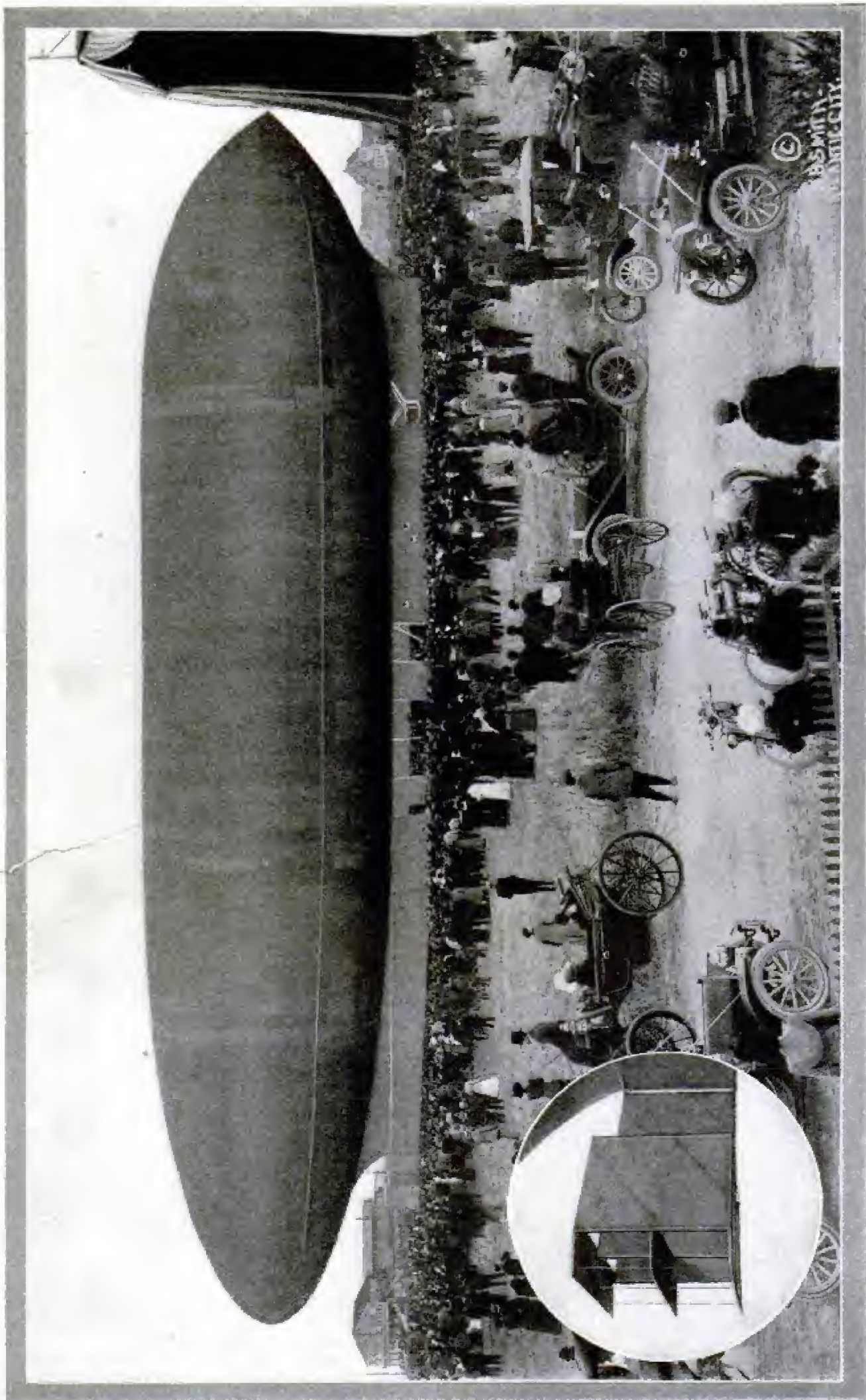
THE LONG LINE OF STEEL-CLADS AT NEW YORK



Pillars of Fire by Night



Towers of Strength by Day



THE VANIMAN BALLOON WHICH WILL ATTEMPT TO CROSS THE ATLANTIC

Views of the Huge Airship Outside Its Shed at Atlantic City and of the Box-Like Rudder

RAILROADS GUIDE AIRMEN BY NIGHT AS WELL AS DAY—EVENTS OF THE MONTH

A PECULIAR feature of the progress of aviation in the United States developed during the past few months in the more or less absolute dependence of the airmen essaying trans-continental flights on the railroads. This refers not alone to the necessary transportation of supplies and spare parts from place to place, but to the usefulness of the tracks as guides to the men in the air. The value of following the railroad tracks to get proper direction of flight was apparent at the start of the great coast-to-coast contest early in September when one of the starters selected the wrong line of trackage and was led a hundred or more miles out of the direct line he had laid out for himself. The usefulness of the locomotive as a night pilot to illuminate the way with its headlight, was developed by Airman G. P. Rodgers when he essayed to complete a day's journey at Hammond, Ind., Oct. 5. Rodgers found himself still some distance from his destination when darkness enveloped him. The headlight of the locomotive on the special train which carried the airman's supplies so lighted up the course, however, that he had no difficulty in completing his trip.

Although the time limit set for the winning of the prize of \$50,000 offered the first man to complete the coast-to-coast trip expired Oct. 10, G. P. Rodgers continued his journey and on Oct. 31 was expected to arrive in Tucson, Arizona, having started from New York, Sept. 17, and broken all records for cross-country flight. Robert G. Fowler, who started, Sept. 11, from San Francisco, and subsequently withdrew from the race, made another start, Oct. 18, from Los Angeles and was expected to meet Rodgers in Tucson. Earle Ovington, who announced he would start across the continent Oct. 11, carrying a sack of mail from New York, smashed his monoplane in

a preliminary flight on the day set for the start and postponed the trip until his machine could again be placed in shape for the journey. A north-to-south flight was started by Hugh Robinson with a hydro-aeroplane, at Minneapolis, October 17. His objective was New Orleans, and he followed the Mississippi River, his frequent landing upon the surface of which made the flight noteworthy, though the trip was given up at Davenport, Ia., because certain cities failed to pay bonuses promised.

An important event from the balloonist's standpoint was the winning of the international race during October by the German balloon "Berlin II," Lieut. Hans Gericke pilot, which traveled a distance of 468 miles, starting from Kansas City, Mo., Oct. 5, to Ladysmith, Wis. Lieut. Gericke's time in the air was 12 hr. 28 min. 20 sec. The "Buckeye," piloted by Lieut. Frank P. Lahm, U. S. A., finished second, with a distance of 370 miles, and the "Berlin," Lieut. L. Vogt, of the German army, was third, with a distance of 350 miles.

The experiments of the United States navy aviation corps at Annapolis, Md., have developed more or less interesting results. Lieut. Gordon G. Ellyson and Lieut. J. H. Towers, in a Curtiss hydro-aeroplane of the dual-control type, made a cross-country flight of 148 miles, Oct. 25, from Annapolis to Buckroe Beach, Va., near Fort Monroe, the officers guiding the machine alternately, thus relieving one another of the strain of the work of piloting and demonstrating this possibility for the first time. They believe this will mean longer continuous flights hereafter.

Two new records were set during the month, in addition to the cross-country record made by Rodgers. Lieut. Bier, of the Austrian army, reached an altitude of 4,000 ft., with two passengers, thus breaking the in-

ternational record for altitude with two passengers. Howard Gill, at St. Louis, Oct. 19, established a new American endurance record, flying 4 hr. 16 min. 35 sec.

The science of aerial navigation lost one of its most earnest students and earliest investigators in the death of Prof. J. J. Montgomery, of the Santa Clara College, at San Jose, California, Oct. 31, from injuries received in falling with a glider he was using in experiments. Professor Montgomery was 50 years of age and for many years had been absorbed with investigations tending toward the solution of the problem of flight. He was the originator of many of the early theories that have been found to be correct and his work resulted in much practical good to those who have achieved fame in aviation since the building of the first actual flying machine. At the time of his unfortunate accident he was experimenting with a glider. He was 120 ft. from the ground when he seemed to lose control of the machine, which fell, turning over as it dropped and burying him beneath the wreckage. His skull was fractured and he died a few hours after the accident.

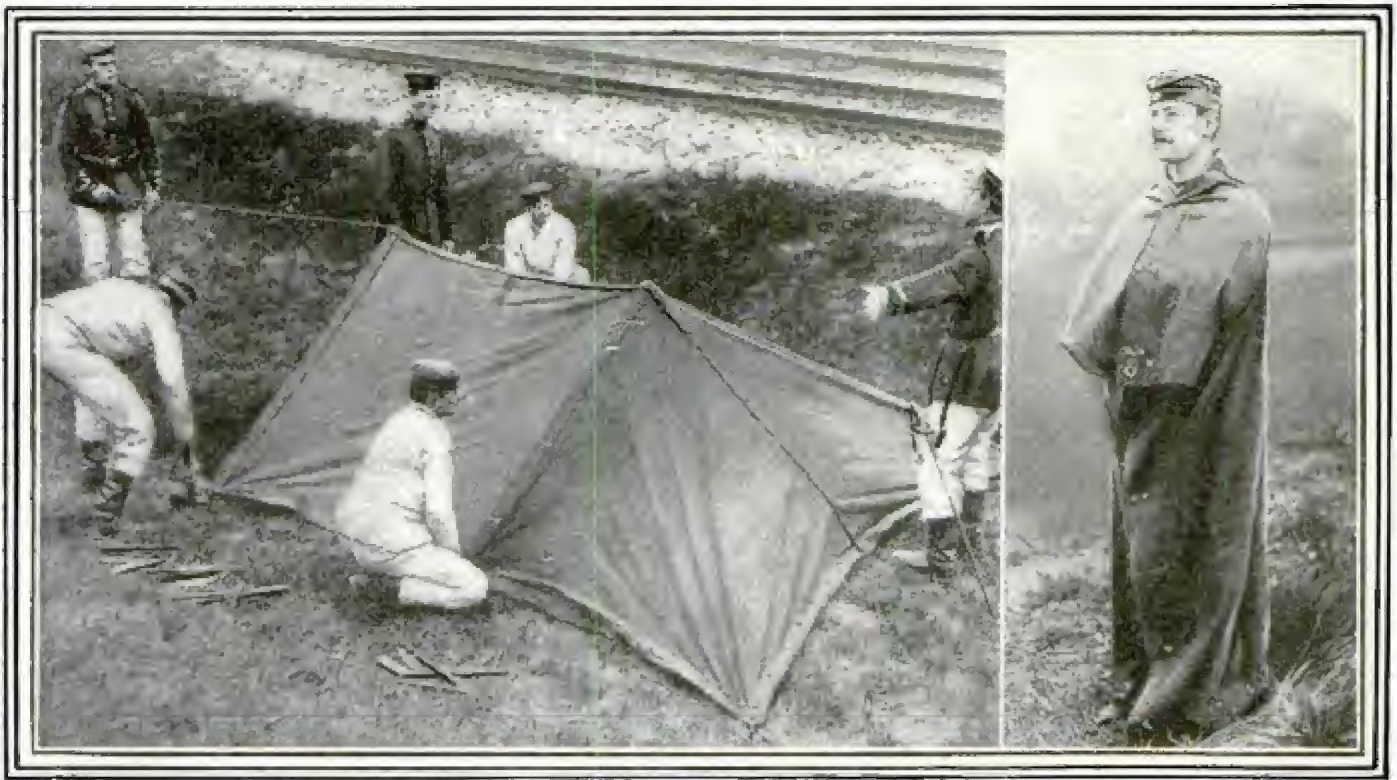
Several other names have been added to the list of airmen who have sacrificed their lives to their devotion to their work. Eugene Ely, one of the most careful and competent of the Curtiss group, like his comrade Frisbie attempted a flight at Macon, Ga., Oct. 19, in a defective machine to escape the sneers and jibes of a country-fair crowd and died from the result of injuries following a fall.

Ely was one of the men who have done much for real progress in aviation. It was he who flew from the deck of the scout cruiser "Birmingham" at Hampton Roads last fall, and again flew from the shore to the deck of the cruiser "Pennsylvania" in San Francisco Bay last winter, to demonstrate the usefulness of the aeroplane to the navy. He was regarded as one of the most skillful and cautious of the airmen and until a short time be-

fore his ill-advised flight at Macon, was known as a man who declined to take unnecessary chances or put his machine through the dips and glides that have become so popular with the patrons of the county-fair aviation exhibitions. Ely changed his methods, however, a short time before his fatal flight and his vol planes became so low that once or twice his mechanics were forced to throw themselves on the ground to prevent their being struck by the machine as it came down. It was at the end of an especially steep glide from a high altitude that the accident happened. Ely failed to elevate his planes quickly enough to ease off the strain on the machine. When he did elevate he was not more than 15 ft. from the ground and the machine broke from the strain. Ely was thrown out and his neck broken. There were 10,000 people at the fair grounds on the day of the accident and after the airman had fallen they bore off bits of his clothing, gloves, splinters of wood from the aeroplane and other ghastly "souvenirs" of the occasion.

Cromwell Dixon, a boy not out of his teens, died from injuries received Oct. 2, at Spokane, Wash., during an exhibition flight at the fair grounds. Dixon attracted attention to himself a few days before by flying over the Continental Divide in the Rocky Mountains. At Joplin, Mo., Oct. 11, James Kinney, a spectator, was struck and killed by a biplane that was just starting on a flight. Kinney ran across the path of the machine and was hit on the back of the neck by one of the lower planes. His neck was broken and he died almost instantly. Capt. John Brodie, a balloonist, fell at Tifton, Ga., Oct. 5, from a height of 700 ft. and was instantly killed.

In Europe two airmen died as the result of injuries received in flight. October 11, M. Level fell from his machine near Rheims and received injuries from which he died Oct. 13. On Oct. 14, Capt. Jean Schmidt, of the Swiss army, fell at Berne and was instantly killed.



Military Tent Composed of Waterproof Capes

New German Army Waterproof Cape Worn as Such

COMBINED ARMY TENT AND WATERPROOF CAPE

One of the latest combinations devised for German soldiers is an infantryman's waterproof cape or coat, which, combined with those worn by his immediate companions in the company, forms a military tent. German

military experts are noted for the knack of working out composite ideas of this nature, which are advantageous in that they lessen the equipment to be carried, or at least add another comfort without adding to the load.

VENTILATING FANS OF GREAT SIZE

The two ventilating fans just installed by the Pennsylvania Railroad in a 4,963-ft. tunnel under Baltimore are of great size, as may be seen in the illustration, which shows an automobile passing through one of the inlets, 11½ ft. in diameter. Both of the fans have outlets 8½ by 14 ft., which discharge downward into a chamber surrounding the upper part of the tunnel, the air issuing from this chamber through a long tapering nozzle, carried around the entire perimeter of the tunnel above the tracks in such a way as to direct the flow of air forward.

Only one fan will be run at a time, the second being held in reserve for use in case of accident. The tunnel requires 450,000 cu. ft. of air per minute, and this volume will produce a ve-

locity of 1,040 ft. per minute. When a train is passing through the tunnel in the same direction as the air currents, the air will travel faster than the train,

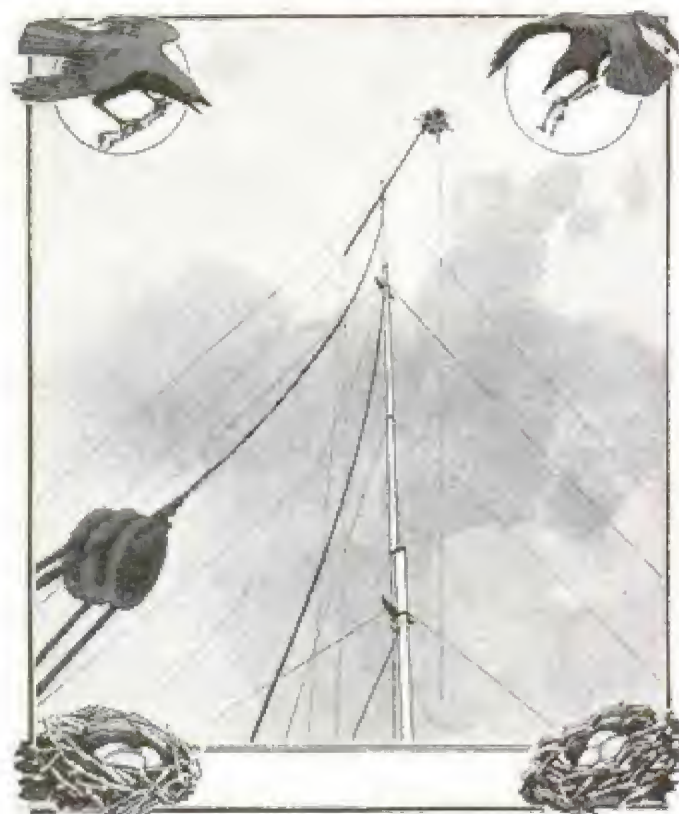


Automobile being Driven Through One of the Inlets of Fan for Baltimore Tunnel

due to the available area for the passing of air being so greatly reduced. Consequently, the smoke from the locomotive is expected to be driven along so far in advance that the engineer will have a clear view of the tracks.

CROW'S NEST ON WIRELESS-TOWER ANTENNÆ

Although a wireless installation is one of the least likely places in the world for a bird to select as a nest



A Crow Selected the Antennæ at the Top of a 160-Ft. Wireless Tower in Tientsin as a Site for Its Nest

site, a crow of the variety common to China built its nest on top of the antennæ of a wireless tower in Tientsin. The height of the nest from the ground is about 160 ft. It is clearly seen in the illustration.

AN AUSTRALIAN STONE-DRESSING MACHINE

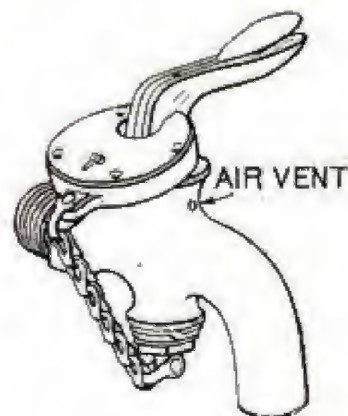
The dressing of granite, marble, Stawell freestone, and other kinds of building stones quarried in Australia, was found so costly with the appliances at hand that several Victorian engineers have constructed a dressing machine of new design.

Its principle is the rapid abrasive action of a carborundum wheel rotated at a high speed. The device consists of a bridge carrying the actuating mechanism of the revolving wheel and supported by a column on either side of a track, on which an automatically operated trolley car runs back and forth. The stone being dressed is secured to this car and thus brought in contact with the grindstone, which speedily smooths or polishes a 9-in. width of its rough surface, according to the degree of fineness of the grinder. As the trolley advances and retraces, the revolving grinder is slowly moved in a lateral direction across the whole surface of the block.

The complete plant, consisting of a tubular boiler, marine-type engine, the necessary winches, driving and reversing gear, overhead trolley cranes, etc., requires the attendance of only two operatives. The abrasive wheel is absolutely automatic in its operation, and all that is required of the men is to run the actuating machinery.

LOCKING FAUCET FOR TANKS

A latching and locking faucet, designed particularly for gasoline and oil tanks and liquor barrels, has been placed on the market by a Pennsylvania manufacturing company. When the lock is inserted in the handle the chain locks the screw at the end of the plug. This prevents the vertical movement or lifting of the plug, thus making it impossible to draw the contents of the tank or barrel.

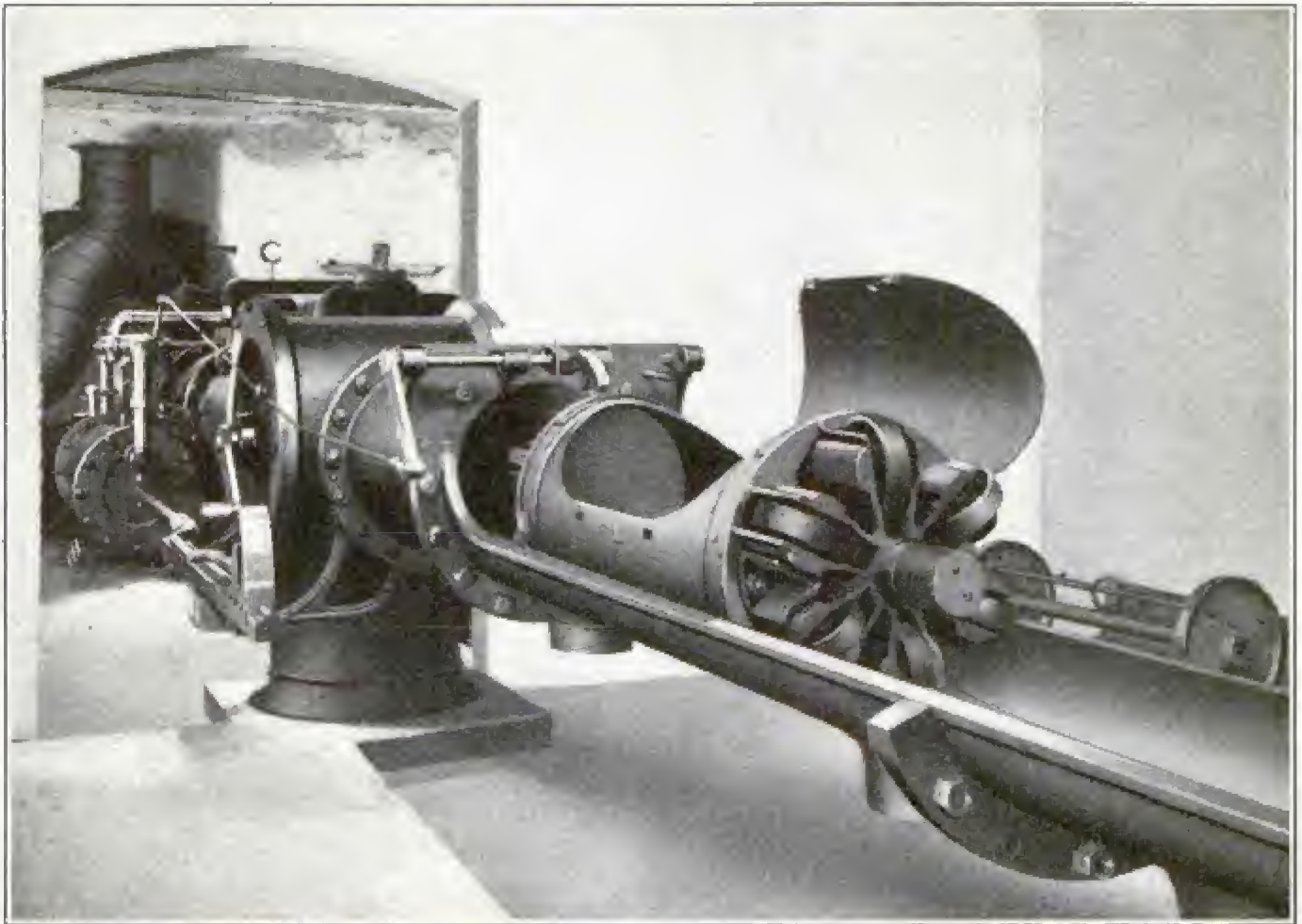


Can an eastern railroad recently, on test, ran a locomotive over one of its branches a total distance of 446 miles without recoaling.

NEW PNEUMATIC-TUBE SYSTEM

A postal employe, who has for the past 15 years been an expert in the pneumatic-tube system of the Post-office Department, has invented a mail tube which may revolutionize the present system of pneumatic delivery. Unlike other systems, this one is operated by vacuum instead of compressed air. Trial tests were recently made of the invention in the subways between the Capitol and House and

travels at a velocity ranging from 30 to 125 miles per hour. The sending mechanism consists of an exhaustor, which provides the suction, and two valves, which are operated by a piston. In sending, the cartridge containing the mail bag is put between the two valves with the inside valve closed. With the cartridge in this position, and the exhaustor working, the outside valve is closed and the inside valve



Terminal of Postoffice Pneumatic-Tube Service, Showing Valves, and Cartridge for Holding Mail Bags

Senate office buildings, with the result that the government has concluded to install a network of tubes which will connect all of the executive departments, the Capitol, House and Senate office buildings, as well as the new Washington city postoffice, soon to be erected adjacent to the union railroad station.

The carrier of the new pneumatic-tube system is propelled by a vacuum of $\frac{1}{8}$ to $\frac{3}{4}$ lb. per square inch, and

opened, which allows the exhaust to act on the cartridge, carrying it to the other end.

At the other end these same two valves aid to check the cartridge. When the cartridge is being sent, the outside valve is closed and the inside valve open. After the carrier has passed the inside valve, it strikes a tripper, which, by means of an automatic piston, closes the inside valve. The air between the valves acts as a

cushion to stop the carrier, and when the inside valve has been fully closed, the outside valve opens, allowing the carrier to slide forth with enough velocity to take it all the way out of the tube.

The carrier, or cartridge, is a cylinder, 18 in. inside diameter, with six ball-bearing wheels on either end. There is about one-fourth inch clearance between the carrier and the tube. One of these tubes will accommodate a mail bag.

FRESH AIR FOR FIREMEN

One of the firemen of Engine Company No. 20, New York, has invented a simple and ingenious smoke-mask



Copyright by Underwood & Underwood, N. Y.

Equipped with Smoke-Masks Which are Provided with Air through Suction in a Garden Hose Generated by the Water Rushing through the Fire Hose

which has been given several tests under trying conditions, and, according to the users, is very effective.

The apparatus comprises a branch pipe fixed to the side of the ordinary fire nozzle, a line of heavily-wired garden hose connected to the branch pipe, and three flexible tubes and masks running from the branch pipe. The rubber garden hose trails along beside the fire hose when the firemen enter a smoke-filled building, the outer end of the hose being in the

street. As the stream of water rushes through the fire hose it sucks a current of air through the garden hose, and this air is distributed by means of the flexible tubes to the smoke-masks. These masks are similar in appearance to football masks.

TARRED ROADS DESTROY BROOK TROUT

Much complaint is being made by anglers in England because the practice of tarring roads is destroying the trout fishing. A recent flood in Westmorland, for instance, carried so much tar into the River Eden that large numbers of trout were found dead in its waters. It is claimed that other small rivers and streams in England have been ruined as fishing preserves because of the tar washed off the roads by the rains.

GOLF COMPETITION ON SHIPBOARD

What is regarded by the players as the first organized golf competition ever played from aboard ship took place recently on the Steamship "Vasari," en route from Buenos Ayres to New York. One day a passenger was driving balls from the deck out to sea in order to test a certain driver, and the question arose as to how far the balls were driven. The result was the stationing of an observer at each end of the ship, with the teeing-ground between them, each recording



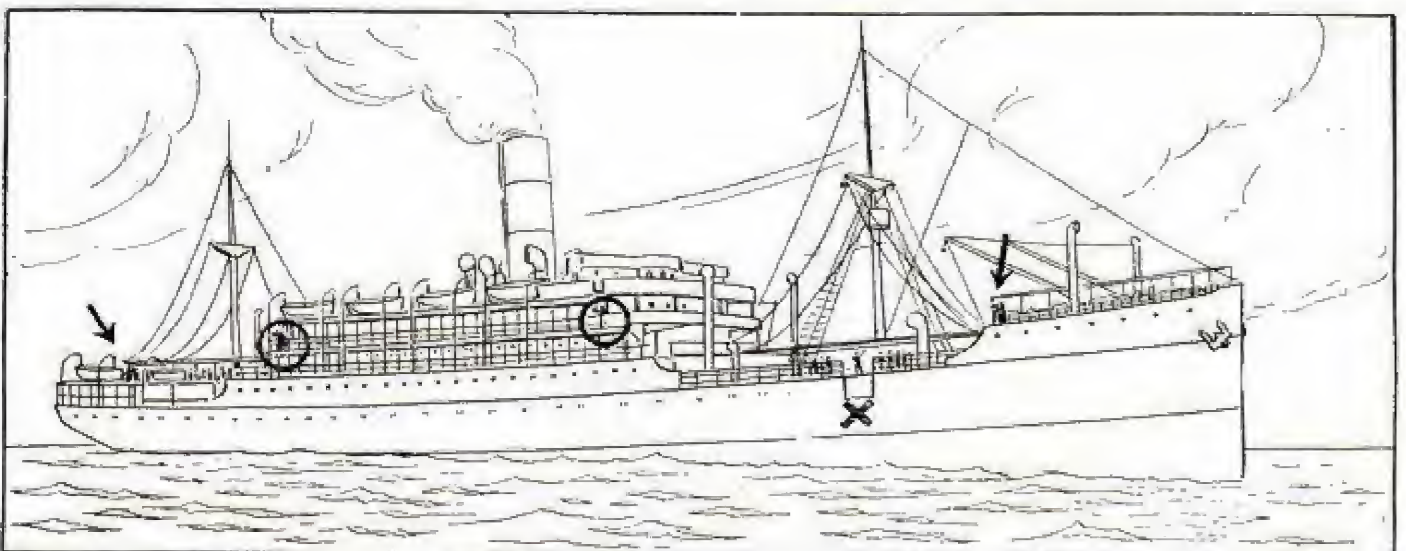
Driving Off in a Golf Contest on Board an Atlantic Liner Plying between New York and South America

the angle at which, from his station of observation, the ball struck the water. The known distance apart of the observers thus formed the base of a triangle, making it a simple matter to measure the length of the ball's flight.

With a method of measurement available, the next requirement was a sufficient number of golf balls, since every drive meant a lost ball. A stock of balls was obtained at Trinidad, the two observers were placed at each end of the base line, 438 ft. apart, and the tournament was held. The mechanism for recording the angle consisted of scales and movable pointers arranged on tables in front of the observ-

ers. A cocoanut-fiber mat served as the teeing-off place, and a section of the ship's rail was removed to allow the balls a free flight. As the forward observing station was close to the tee, the observer at this point could see when a drive was made, but the tee was hidden from the aft observer by the intervening portion of the ship. Therefore, two signalmen with flags stood at each end of the promenade deck and wig-wagged when the balls were driven off.

The winning drive of this unique tournament was one of 530 ft., made by W. B. Price of the Audobon Golf Club, Louisville, Kentucky.



The X Shows the Tee, the Arrows Indicate the Position of the Observers Who Determine the Length of the Drive, and the Circles Indicate the Position of the Signalmen

A PORTRAIT WITH EVERY HAT

Customers of some of the leading milliners of Paris have been intensely surprised recently, on receiving the



The Hidden Artist Makes a Portrait while the Customer is Trying on the Hats, and This is Later Pasted onto the Box Bearing the Purchase

latest creation in hats selected by them, to find a portrait of themselves painted on the hat box. Having no remembrance of sitting for a portrait, these women have, naturally, inquired how the seemingly impossible was accomplished, and this has given publicity to the newest novelty evolved by a few of the milliners as a compliment to their best customers and an ingenious method of advertisement.

While the customer is intent on selecting the hat, a fascinating proceeding usually requiring at least half an

hour, an artist seated behind a screen swiftly transfers the features of his unconscious subject to paper. The next day the hat is delivered, and on the box is pasted the original drawing of the buyer as she appeared while trying the hat on.

HUMAN ORGANS RADIO-ACTIVE

It has been known for some time that the normal tissues of the human body, especially the brain, emit slight radiations which are chemically active, and now a professor of Heidelberg University announces that the human organs are radioactive as well. The brain substance is most active, the heart and liver to a lesser degree, and the spleen and kidneys but very slightly radioactive. The social position or occupation of the individual seems to have no influence on this activity, but, on the other hand, it seems to increase with age.

The Heidelberg professor suggests as the cause of the radioactivity the presence of mineral substances absorbed by the body from food and drink, which would seem to explain its increase with age. He does not commit himself on the question as to whether or not these radiations have any relation to vital phenomena.

CINCINNATI'S ROOF-GARDEN SCHOOLROOM

This roof-garden schoolroom, erected on the roof of one of Cincinnati's public school buildings, and said to be the first of its kind in the United States, is used by 30 children whose health requires much pure air and sunshine. If the idea proves itself of worth, it will be extended to other Cincinnati schools.

The roof-garden room is nearly 170 ft. from the noisy streets, and is equipped on three sides with glass-paneled swinging doors. On clear, warm days the three sides are thrown wide open, thus making it practically



Schoolroom on Roof of One of Cincinnati's School Buildings Where Unhealthy Children May Have More Fresh Air and Sunshine

an outdoor schoolroom, but in cold, stormy weather the room is kept warm by means of steam pipes connected with the main plant in the big building underneath.

FOR THE HANDLING OF RADIUM

Magnificently equipped with about half a teaspoonful of radium, the Radium Institute of Great Britain opened its doors in London recently for the exploitation and storage of the substance whose curative powers are considered so wonderful. It would seem that not much of an institution were required for the handling of half a teaspoonful of material, yet this amount is considered a great, priceless treas-

ure. The disk shown in one of the illustrations, for instance, holds a quantity so small as to be almost invisible to the naked eye, yet this amount, about 40 milligrams, has a value of \$4,000.

The other illustration shows a device by means of which as small an amount as a millionth part of a pound of radium can be weighed. The weighing has to be done under a powerful microscope, as the operation is far too delicate to be seen and recorded otherwise.

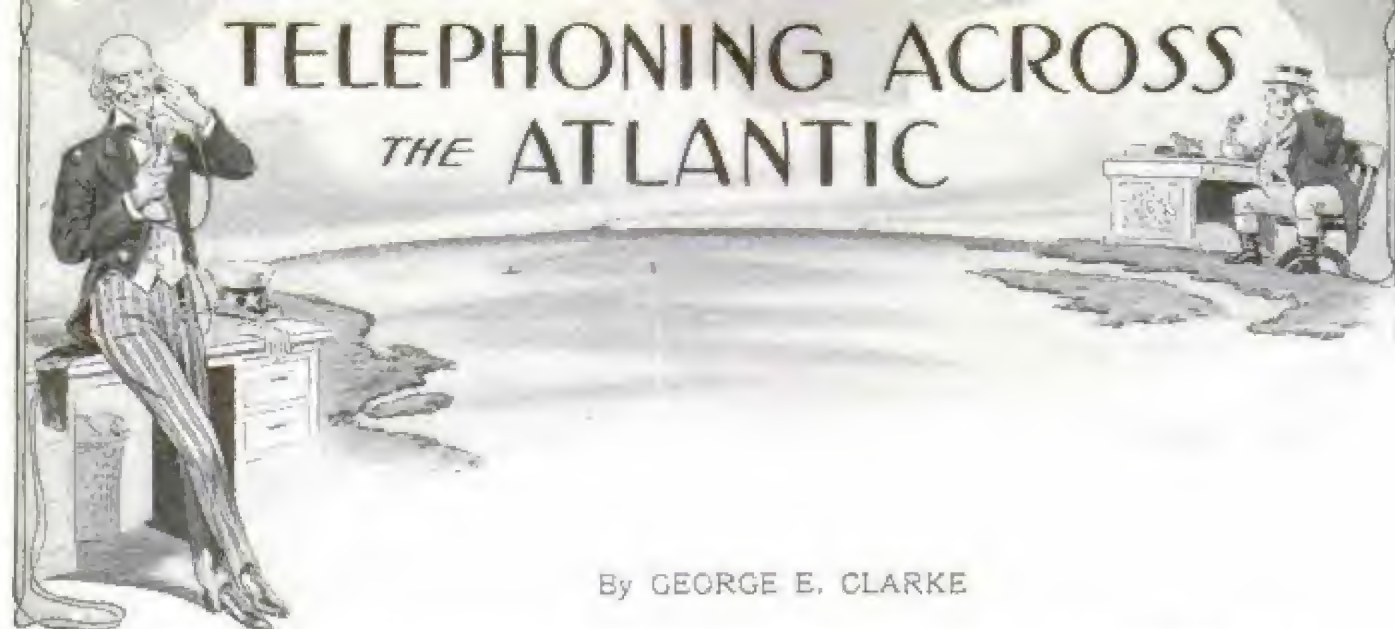
¶The electric-sign privilege on the roof of one of the buildings in Times Square, New York, has been leased for \$25,000 a year.



This Disc Holds \$4,000 Worth of Radium, a Quantity Almost Too Small to be Visible to the Naked Eye



Balance on Which as Small a Quantity of Radium as One Millionth of a Pound Can be Weighed



By GEORGE E. CLARKE

As in all other fields of human endeavor, the engineer is always setting for himself a great task, beyond his powers today probably, but toward which he can bend his energies and direct his increasing store of knowledge. Today telephonic communication between the United States and Europe is a dream, just as the Panama Canal at one time was a dream. But telephone engineers have established communication between England and France by laying a cable under the English Channel and others have made it possible for a man in New York to talk to a friend in Denver.

TWICE within comparatively recent times has the feat of telephoning across the Atlantic Ocean been pronounced not only feasible but within the probability of almost immediate accomplishment. The first prophecy was made about 35 years ago by Dr. Alexander Graham Bell, soon after he had invented the telephone. But in a recent letter to *Popular Mechanics Magazine*, Dr. Bell said: "I may say I am a little more skeptical now . . . I have no doubt, however, that it will be done some day." The second prediction was made by a former president of the American Institute of Electrical Engineers in an article on the important researches of Prof. M. I. Pupin, of Columbia University, by which the problem of long-distance telephony over land lines of hundreds of miles in extent was made practical and many other authorities also concurred in this view. Now, as Dr. Bell has said in his case, they are more skeptical.

But, after all, the difficulties in the way are only of a practical nature and probably will soon be overcome. Only a few months ago the telephone engineers succeeded in adapting Pupin's invention to a submarine telephone cable across the English Channel, between England and France, so that telephone conversation can now be

carried on successfully between the two countries. And this was in the face of hostile criticisms by eminent European and American telephone engineers, that the practical difficulties in the way of this accomplishment could not possibly be overcome. Yet the thing was done in spite of the doubting Thomases of the telephone profession. Then why not a transatlantic submarine telephone? It is, of course, a much more difficult proposition, but the obstacle is one only of degree, and as the problem is theoretically possible, it is quite likely that eventually a solution will be found.

Major W. A. J. O'Meara, engineer-in-chief of the work of connecting England and France by telephone, is confident that transatlantic telephony will come with continued advancement in the means of increasing the range of telephonic speech. In a letter to *Popular Mechanics Magazine* he says:

"As to my views on the possibility and value of establishing a telephone across the Atlantic, I may say that such a service would of course be of considerable value, but such a desirable consummation does not at present appear to be in immediate sight.

"Existing means or devices for increasing the range of speech both in submarine and subterranean conductors

may be very considerably improved in the near future, and further improvements may be made both in transmitting and receiving apparatus.

"In view of the enormous strides made in recent years in the direction of increasing the range of telephonic speech, I think the prospect of transatlantic telephony is full of hope, and I confess that I have great faith in the ability of engineers to provide eventually the means for closer intercourse of peoples separated by obstacles which may be considered insurmountable nowadays."

At first blush the layman will point out that transatlantic submarine-cable telegraphy has been in successful operation for many years; so why not transatlantic telephony? The answer is that while telegraphy is possible as long as the receiving station is able to discern the difference between a short and a long electrical impulse, the impulse that constitutes an electrical telephonic message must be transmitted and received with little or no alteration in order to be recognized as articulate speech at the receiving station.

Cable telegraphy differs from land telegraphy on account of the fact that a submarine cable possesses in a high degree what is known as "capacity;" that is, before it will transmit electrical impulses in measurable amounts, it must be electrically charged in a manner similar to a Leyden jar. In a way a submarine cable may be likened to a great pipe through which one desires to pass water in stated amounts at predetermined intervals of time. First, of course, it would be necessary to fill the pipe with water. So, with the cable, one would have to "fill" it with a certain amount of electricity. Then, in the case of the water pipe, a certain amount of water pumped in at one end would cause an equal amount to be pushed out at the other end. But the effort to set in motion the huge amount of water in the pipe, and to overcome the resistance to movement of the water, on account of friction, would take time and the motion at the far end

of the pipe would be slow. The analogy is not quite a perfect one, but it will serve to illustrate that even after a submarine cable is sufficiently charged with electricity, a transmitted impulse is very feeble and long drawn out. The late Lord Kelvin—then plain William Thomson—devised the siphon recorder in connection with the first Atlantic cable (1857-1866), which solved the difficulty of receiving and recording the feeble impulses transmitted through a submarine telegraph cable, and the time-lagging element was obviated by slower speed in sending. Subsequent inventions have since enabled the sending speed to be increased.

In the case of the telephone this enfeebling of the sending impulse, and more especially its attenuation, are absolutely fatal to successful transmission. In the original Bell telephone, the transmitter was, in fact, a dynamo, a device for converting the mechanical energy of a vibrating diaphragm (set in motion by the sound waves produced by the human voice) into electrical current, which current was transmitted along a wire and converted back again into vibration of another diaphragm, thus reproducing the sound. Such a current was extremely feeble. Indeed, it has been calculated that the work done in raising a weight of one pound through a vertical distance of one foot would, if transformed into electrical energy, serve to keep an audible sound in a Bell telephone for over 340,000 years! Of course the original telephone has since been improved so as to admit of its acting as a relay by which the current from an electric battery can be controlled by the transmitter to send messages through considerable distances. But still the fact remains that telephone currents are necessarily small, and that when they are transmitted through long distances, especially when "capacity" is introduced into the line, the impulses lose enough of their primary characteristics to destroy the articulation at the receiving station.

Professor Pupin, after a long mathematical investigation and much practical experimentation, succeeded in eliminating or counteracting much of the disturbances that cause the electrical telephonic impulse to be distorted in passing through a long wire. This he did by introducing so-called "loading coils" in the line at certain intervals. These "loading coils" are coils of wire of small resistance and many turns, so that the current, in passing through each turn of wire, acts inductively on itself, that is, on the current passing through the other turns.

While this has a choking or throttling effect on the current, impeding the rate of transmission to a certain extent, it tends to preserve the original characteristics of the telephonic impulse so as to enable it to be transformed at the receiving station into articulate speech. The effect has been likened to the problem of transmitting energy by snapping a string so as to produce undulations or waves. When the string is loaded with weights at intervals, more energy can be transmitted in this way. Pupin's "loading coils" are analogous in action to these weights.

By this means, long-distance telephoning on land has been made practical, the best instance being the line between Denver and New York. It is only a matter of time, say the experts, perhaps only a year or two, when New York will be able to talk to San Francisco, clear across the continent. This is about the same distance as that between America and Europe, so

that when the bugbear of "capacity" can be overcome, practically and commercially, the lesson in optimism given to the telephone pessimists by Major O'Meara and his associates, in successfully installing a submarine telephone cable between England and France, may be repeated on a bigger scale, and a New York long-distance operator may some day think nothing of calling over the telephone cable, "Hello, London, give me St. Petersburg!"

There are those who believe that if the problem of transatlantic telephony is solved at all it will be by wireless. So far wireless telephony has not progressed sufficiently to threaten the existence of the present method, if indeed it ever will, but enough has already been done with it to indicate great possibilities for it in the future, probably in fields peculiarly its own and not encroaching on the other spheres of electrical communication. Perhaps one of these fields will be transwater telephony. It remains only for some one to discover a means of controlling sufficiently intense electrical radiations through space by the feeble energy of the sound vibrations of the human voice, and possibly also of limiting the direction of these radiations. Then if some as yet undiscovered William Thomson can devise a sensitive receiver to pick up these radiations and translate them into speech, the problem will be solved. These, indeed, are difficult nuts to crack. But in the light of past achievements the thing does not seem impossible.

A 20,000-CORD PILE OF PULP WOOD

A great pile of pulp wood, located at Covington, Va., of which the accompanying illustrations show part, contains upward of 20,000 cords, and is the product of about 650 acres of spruce timber. This amount of spruce, when mixed with the required amount of soda pulp, which amount requires about 10,000 cords of poplar wood, will

make approximately 48 to 50 million pounds of paper.

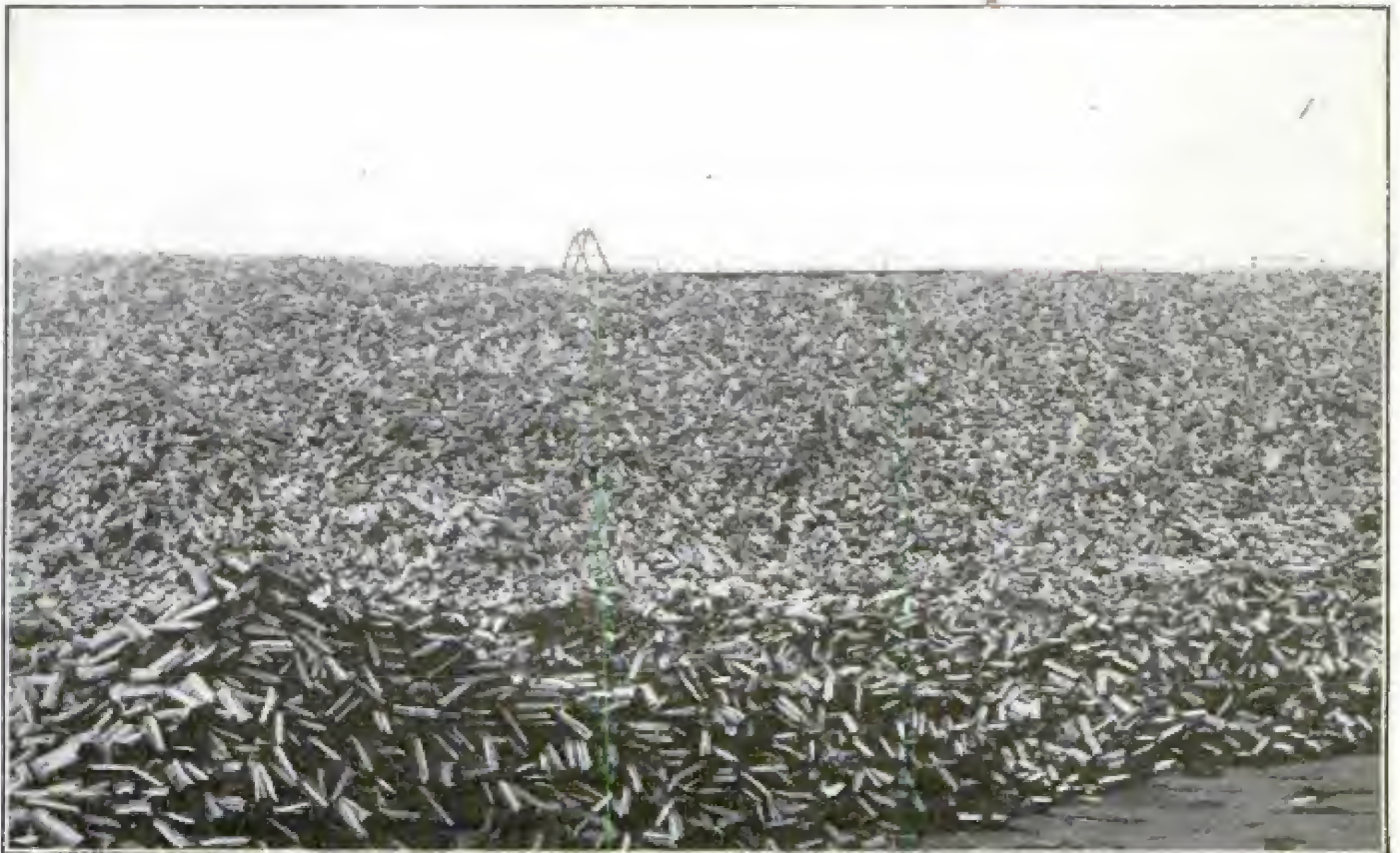
The wood is all cut into 2-ft. lengths and is split so that it will go through a 12-in. ring. The pile has a height of about 75 ft. It is interesting to note that the paper company using this spruce plants three trees for every one cut. Approximately two out of every



The Pile of Wood of Which This Illustration Shows a Section Will, Mixed with Soda Pulp, Make About 50,000,000 Lb. of Paper

three trees thrive, according to the officials of the company, so that in the course of about 20 years the company's available wood supply will be much greater than it is now.

To illustrate what 50,000,000 lb. of paper means, it may be mentioned that the individual copies of the November issue of this magazine weighed 19 ounces, so that such a quantity of



Portion of a Pile of Pulp Wood That Covered About 650 Acres as Standing Timber

paper would be sufficient for the printing of 42,105,263 copies. If the sheets of paper used in that many Popular Mechanics magazines, about 10 by 7 in. each, were spread out they would make a blanket covering an area of 110 square miles. If their leaves were placed end to end they would form a continuous band extending for 996,810 miles, or about 40 times the circumference of the earth at the equator.



Inset Section of Roadway to Prevent Obstruction of Traffic by Vehicles Stopped before Houses

STREETS HAVE CONCRETE INSETS

In front of several residences of Independence, Kan., are concrete insets, designed to provide room for a standing team or automobile. Through the adoption of this idea, vehicles may be pulled up in front of a house without

obstructing the street. The insets have a slope to the curb line to provide for drainage.

ELECTRIC SHOCKS FOR BALKY MULE

The usual way of getting action out of a balky mule is to beat him with a whip until the whip wears out and then give up the job. Sometimes a balky mule is started by means of a bonfire built beneath him, in which case, if he is attached to a wagon, the mule is quite apt to move forward just enough so that the wagon is over the bonfire. An Arkansas man now comes forward with an improvement over any other method yet tried, says Engineering and Contracting. He uses a small electric battery in the wagon with a switch convenient to the driver's hand. An insulated wire runs from the battery to the headstall of the bridle; thence to the ring on the bit and then back to the mule's tail. When the animal gets stuck in his tracks the driver turns on the current and results follow immediately. It is not stated whether the mule starts with his hind feet first or not.

"LEST YE FORGET"

Probably the commonest reminder adopted by the good wife when she desires to make absolutely sure that her "forgetful half" will not forget, is the tying of a piece of string around his finger, but there are many more subtle reminders now in use.

One man's wife, for instance, pins the letter she wishes her husband to post in his pocket with other things which he is sure to require during the day, while another sticks a piece of paper, on which a request is written, over the face of his watch. It might

be an improvement, however, to make the piece of paper small enough so that the watch could still tell time.

Business men who are in the habit of forgetting little things sometimes jog their memories by sending themselves a post card to the place where the work is to be done. Another good method of stimulating the memory is to place a ring usually worn on the finger onto the key ring, while one man, knowing that he will go frequently to his tobacco pouch during the day, places a note therein.



This Wife Pins Her Letter to Articles He is Sure to Require During the Day



Placing Finger Ring on the Key Ring is Also a More or Less Time-Worn Reminder



Sending Himself a Post Card as a Reminder of Little Things Requiring Attention



A Reminder Stuck on a Watch Case



A Note in the Tobacco Pouch is Certain of Being Remembered



A Piece of String is a Time-Honored Form of Reminder



Armorplate from Fore Part of the "Liberte," Weighing Nearly 10 Tons, Thrown against Side of the "Republique" 1,000 Ft. Distant

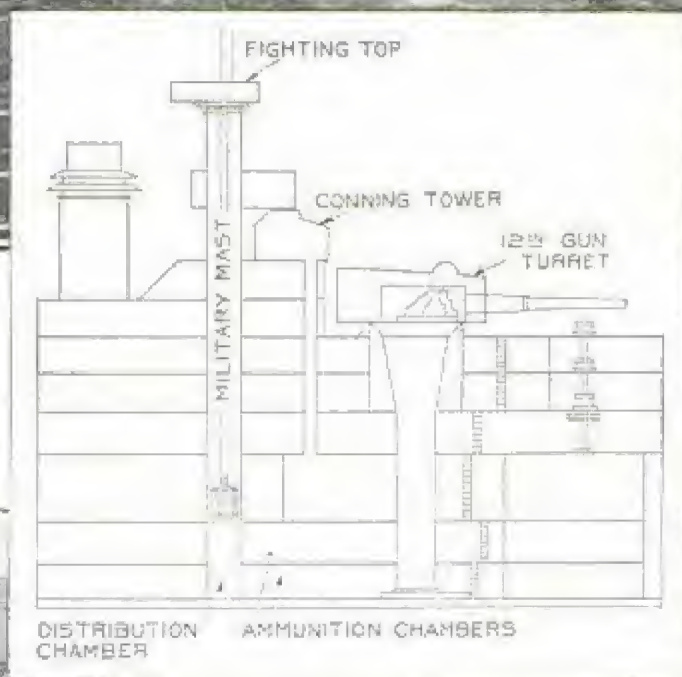


All That Remained Visible Above Water of the "Liberte" after Explosion

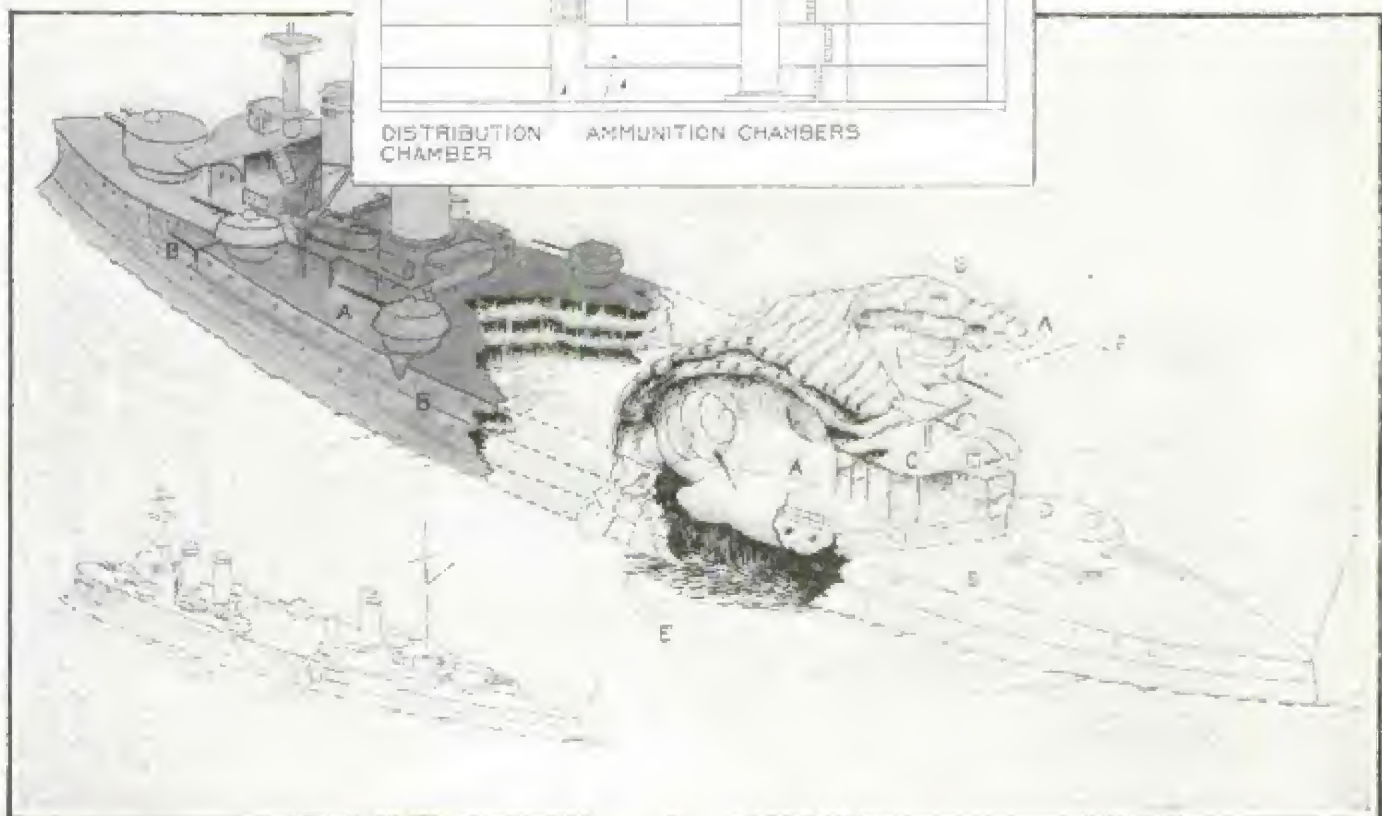
Experts appear to be convinced that the explosion on the French battleship "Liberté" was caused by the spontaneous combustion of the "B" powder used in the French navy, although the officials at Paris have as yet reserved their judgment. It was developed during the course of the investigation of the accident that the fumes from the burning powder made it impossible for the men to flood the



Rescuers Approaching Wreck. Note in Center One of the 7.5-In. Gun Turrets Turned Completely Upside Down



Ammunition Chambers at Foot of Military Mast. Flames Were Seen Issuing at Fighting Top Immediately after First Explosion



Effects of Explosion: Vessel Split about Midships; Fore Part (Shaded) Sunk or Completely Shattered, Two Upper Decks with Gun Turrets Bent Back Over Aft Part. A, Upper Deck; B, Main Deck; C Bridge; D, 12-In. Gun Turret; E and F, 7.5-In. Gun Turrets

magazines and the poisonous nature of these fumes were noted as similar to that in other explosions for which the "B" powder has been blamed. Those familiar with the ordnance stores of the French navy believe that too little attention has been paid by the experts to the safety in handling and storing of explosives.



Burgess Swimming across the English Channel

BURGESS SWIMS ENGLISH CHANNEL

William Burgess succeeded in swimming across the English Channel in September, after many unsuccessful attempts covering several years. In one or two of these attempts he was

compelled to give up when only a short distance from the coveted goal. Burgess is the second man to swim the Channel, Matthew Webb having done so in 1875.

PEDOCYCLE INVENTED BY CALIFORNIAN

A pedocycle, propelled by the aid of mechanism somewhat different from that adopted for other types of pedocycles, has been invented by a mechanic and electrician of Los Angeles

and tried out by one of the members of the police force of that city. The skates consist of a frame for the wheels, a foundation or platform for the foot, a set of gears, and a spiral shaft. When the weight of the wearer is applied to one of the skates, the platform and shaft are forced downward, and the shaft passing through the gears works like a worm gear, thus driving the rear wheel, which is connected through a ratchet gear with the gears driven by the spiral shaft. The ratchet also forms a coaster brake, allowing the skate to speed along the pavement with the foot still bearing upon the platform and spiral shaft. The wheels are 6 in. in diameter and rubber tired. The speed obtained is about 20 miles an hour.



Mounted on a New Type of Pedocycles, the Gears of Which are Driven by the Weight of the Body Descending on the Spiral Shaft

WASHINGTON MONUMENT ATTACKED BY "GEOLOGICAL TUBERCULOSIS"

By JOHN S. MOSBY, Jr.

The Washington Monument, at the national capital, highest of stone structures, and designed by its builders to stand as long as the pyramids, is suffering from a disintegration that, while not immediately fatal, will materially shorten its life.

This great shaft, 555 ft. in height, consists of walls 15 ft. thick, at the base. These walls are made up of an outer facing of marble blocks and a 4-ft. inner wall made of granite and other hard stone. Between these two walls there is a filling of heterogeneous stone, held together by a cement. This describes the first 190 ft., which is the part now affected. This part was built continuously from the beginning of the structure. Then, for years, the construction halted at that height. It is the interior filling between these walls that is now, through the deadly effect of heat and cold and dryness and dampness attacking it alternately, beginning to disintegrate and ooze out between the joints of the outer wall and the crevices made by the action of the elements. Says Mr. Bernard Green, superintendent of the monument



instead of being set with solid-built masonry. On this conglomeration, the weather is now beginning to act. The lime substances in this mass are especially disintegrating under the action of water, and oozing out between the joints in the outer masonry, again solidify and form, as it were, scales or barnacles on the white marble of the outer facing." Just how long this process (which a tourist defined as "geological tuberculosis") will have to continue before the sufficient weakening of the lower part of the monument to destroy it, neither Mr. Green, nor any government scientist will venture to declare.

Prof. G. P. Merrill, head curator of geology at the National Museum, and one of the government experts on matters geological, however, frankly gives as his opinion that the monument, through these internal agencies, coupled with fundamental errors in the construction of the great pile, will bring about its total ruin long before other world buildings of the same character of structure will decay—and very long before the age to which its designers had fondly hoped it to live. Professor Merrill thinks it is a bad job, literally, from top to bottom. This is what he has to say about its construction:

"This gigantic pile, designed as a monument to the Father of his Country, and which stands upon the banks of the Potomac River in



Filling Oozing through
Outer Wall

grounds, who knows more about its history than anyone living:

"When this lower 190 ft. was built, a great portion of the vacant space between the two walls was filled in with all manner of rubble, held together with such manner of cement as was used in the '40's."



Deposit of Structural
Material near Base

the city of his name, is, so far as quality of material is concerned, not only wrong side up, but wrong side out as well! The very best and most endur-



Cracks in Washington Monument Caused by Action of Alternating Heat and Cold, Dampness and Dryness

ing material of the entire structure lies in the inner courses of the upper portion of the work."

That is the part where the elevator

lands, and which is subjected to merely the trifling burden of the apex.

"The poorest and weakest of the material," continued Professor Merrill, "is comprised in the outer portion of the first 190 ft., which has to bear the weight of the superincumbent 350 ft. and more, and has to receive, besides, the wash from all the rain that falls upon the portion above."

Professor Merrill went on to say that, as regards this present "tuberculous" ailment, it could be cured. That is, by building shoring and supports, the entire outer facing and the rubble filling for the first 190 ft. could be removed and replaced with solid granite masonry.

At the request of a representative of Popular Mechanics Magazine, he analyzed some of the deposit left on the outer facing from the interior disintegration and found it to consist of just the same material as that inside—thus confirming the aptness of the tourist's definition!

ALPINE CLIMBING BY RAILROAD

The days when only the adventurous could reach great heights in the Alps and perfectly realize the grandeur of the ice and snow-capped peaks are

laborious task, can ride in comfort to heights only accessible a few years ago by arduous climbing and the facing of many dangers.

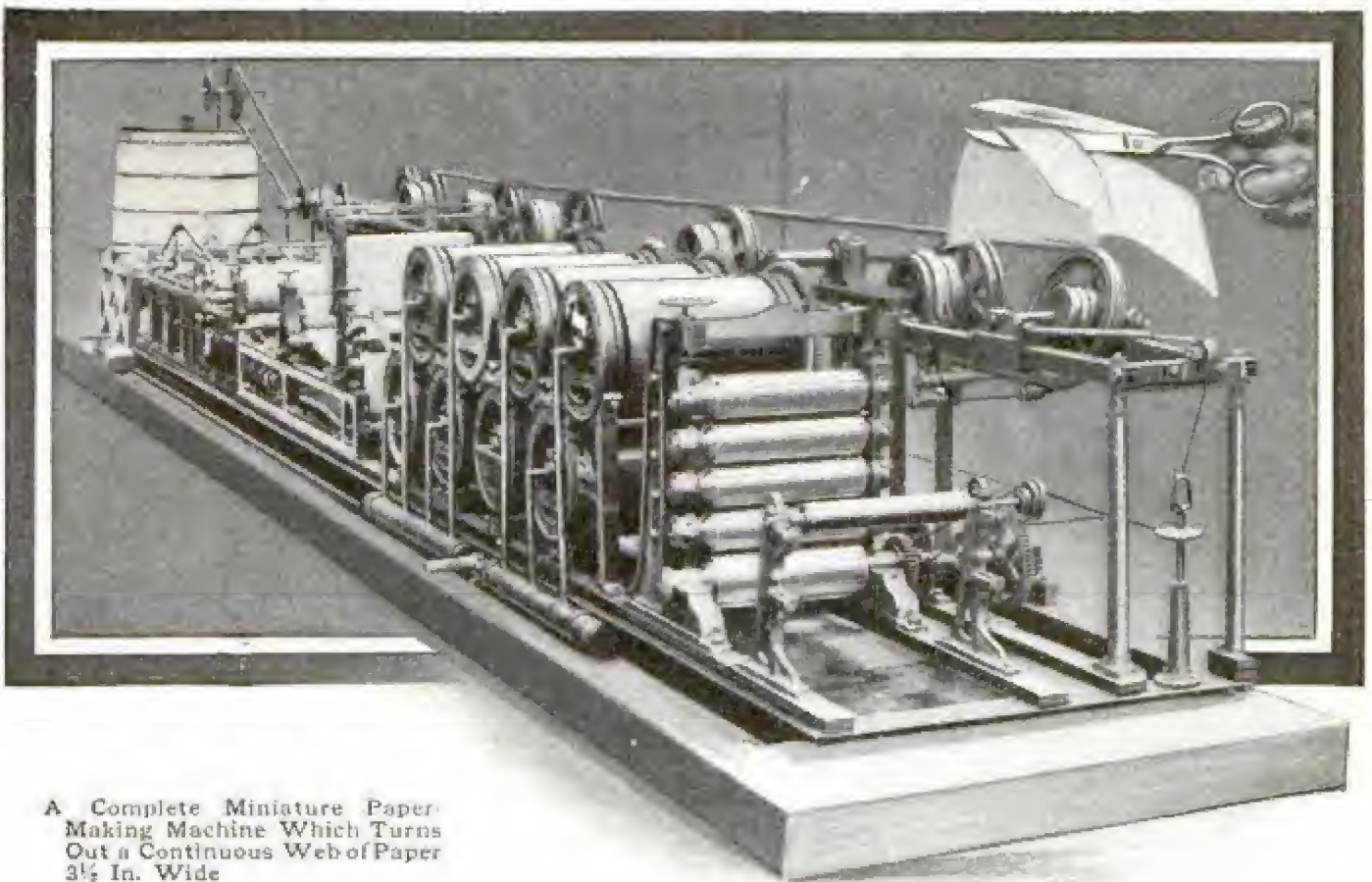


The Unique Opening of the Jungfrau Tunnel Which Looks Out on the Guggi Glacier at an Altitude of 11,090 Ft.

How the Jungfrau Railway is making the snowy heights accessible is a remarkable example of modern engineering. The present terminus is Eismeer, which is at an altitude of 10,100 ft., but the last stage of the tunnel between Eismeer and Jungfrau Joch is now practically completed. Jungfrau Joch station will be 11,316 ft. above sea level, close to the magnificent snow and ice fields of the south face of the Jungfrau glaciers. On one

past. Now the vast number of tourists who are too timid or physically unfit for mountain climbing, or those who do not care to undertake such a

stretch the tunnel lies not only under perennial snow but so near to the outer wall of the mountain that the temperature drops below freezing point. So



A Complete Miniature Paper-Making Machine Which Turns Out a Continuous Web of Paper $3\frac{1}{2}$ In. Wide

near, in fact, that at one place a tunnel window has been cut, to overlook the Guggi Glacier. This window is at an altitude of 11,090 ft.

In the construction of this railway electricity is utilized for everything. It drives and heats the trains, operates the drills, fires the dynamite, melts the ice, and even bakes the bread required to feed the construction men.

NOVEL MINIATURE PAPER-MAKING MACHINE

The smallest paper-making machine in the world actually producing a continuous web of paper is shown in the accompanying illustration. It is 8 ft. long by 1 ft. wide, and manufactures paper having a width of $3\frac{1}{2}$ in. The drying cylinders, of which there are eight, are heated by gas, which is a new method giving excellent results in this instance. The machine requires the attention of but one person.

This miniature paper plant was designed as a means of demonstrating in a practical way the entire process involved in converting paper pulp into

the finished product. It has fulfilled this task so well that the original model has been duplicated several times, several technical institutions now being equipped with them.

TO TUNNEL UNDER CANALS OF VENICE

Tunnels are so common that such construction is hardly more thought of at the present time than the building of a road, but that Venice, whose thoroughfares are canals, should contemplate an electric railway operating in a tunnel, as a means of communication between points, is considered by the foreign press as sufficiently incongruous to arouse interest. The plan is to connect the Piazza di San Marco with the little island of Lido, a fashionable resort of the Venetians during the warm season, by means of such a tunnel and electric railway. The tunnel would be about two miles long.

¶ It is estimated that the wine production in France this year will amount to 1,227,236,000 gal.

NEW TYPE OF TEA STRAINER

The ordinary tea strainer has the disadvantage of retaining a small quantity of tea in the mesh which then



The Non-Dripping Tea Strainer and the Method of Using It

drips on the tablecloth. This fault is claimed to be overcome in a new type of strainer placed on the market in France. It is a rod of twisted wire with a tuft of finer wire at its lower end. The method of inserting it in the spout of the pot is clearly shown.

The reason tea does not drip from the wire, as in the old type of strainer, is said to be because of the fineness and close proximity of the wires, the tea remaining in the tuft after pouring being drawn back into the spout by capillary action.

THE FRENCH DIRIGIBLES

Although the dirigibles of other nations are receiving more notice than those of France, due to the disasters that are repeatedly overtaking the former, the French airships are not by any means being neglected by the army. The military dirigible "Adjutant-Vincenot," for instance, recently made a continuous flight of 16¼ hours with eight passengers. It flew a distance of 400 miles at an altitude of 3,200 to 4,900 ft., without the slightest mishap. Later, the "Adjutant-Reau," carrying nine passengers besides the crew, flew for 21 hr. 21 min., covering 600 miles. During this flight the weather was far from favorable, violent contrary winds being encountered.

GREAT GUNS CLIP WAR'S FINE FEATHERS

The application of science and mechanics to the art of war has resulted in depriving the field of battle of most of its spectacular features. No more can a picture of battle show a gaily uniformed mass of horsemen dashing madly at a crouching foe. The horsemen may dash madly, but the color scheme has been spoiled by clothing the men in subdued raiment, the intent of which is to make them as nearly invisible as possible. The flash and glitter has also been taken from the battle picture by the substitution of dull-finished metal for the highly polished steel of former generations.

In the gun pits of the seacoast fortifications, the picturesqueness has all departed. War here will be carried on by machinists, electricians and chem-

ists. And they will dress for their part just as they dress for work in the shop, the power house and the laboratory. Overalls and jumpers have taken the place of gold lace and broadcloth. The average crew of a big 12-in. gun is totally devoid of military appearance. The men wear dirty, grease-covered brown canvas trousers and jumpers—that is those men who are not wearing brown or blue overalls without jumpers. Some of them have campaign hats, some of them little round canvas hats and some are in caps, and they do not seem to preserve any formation or have any regularity of movement in loading and firing. Of course there are regulations as to firing and loading and conveying ammunition that are all carefully observed—just as there are



War in the Gun Pits of the Seacoast Fortifications is Now Carried on by Machinists, Electricians and Chemists

regulations for running any other big engine, dynamo, derrick, steam shovel, etc. The same is true on board the ships. The highest physical efficiency is the object sought, not daintiness of dress or the formation of a pretty picture. It would have to be a lengthy

canvas indeed that would show the bombardment of a fort by a fleet with a distance of from 7 to 10 miles separating the combatants and none of the men operating the guns being capable of seeing the target toward which he is directing his aim.



Courtesy of The Brooklyn Eagle

Overalls and Jumpers have Replaced Gold Lace and Broadcloth—A Group of Modern Artillery Officers "Uniformed" as for War

CHICAGO CHINESE HAVE OWN TELEPHONE DIRECTORY

The company operating an automatic telephone system in Chicago has

定江接裝來去水喉自來火管
卡勒街門牌 2114

啓者弟向來往水喉自來火管業已十八年
務求精工價錢真實如雲為友光顧仰
祈留心是所厚望焉

DANIEL GUNN 喊線壓到物的公司 2114
639 S. Clark Street

華人埠卡勒街喊線號數

2114 和順隆唐山雜貨門牌	2118
2114 安良堂樓上二層門牌	2110
致中和唐山雜貨門牌	2112
2114 廣利源唐山雜貨門牌	2112
2114 源源號唐山雜貨門牌	2112
2114 泰和號唐山雜貨門牌	2112
2114 三隆號唐山雜貨門牌	2112
2114 廣和盛中日玩器門牌	2112

輔列芝勞士承接木工
卡勒街門牌 2114

啓者弟向蒙華人賜顧已二十餘年矣
凡所作工夫快捷無誤工價相宜倘
蒙貴客垂盼或喊線或親到無
不招置妥當也

FRED J. LOWES 喊線壓到物的公司 2114
639 South Clark Street

Special Directory Furnished for the Chinese Subscribers of the Automatic Telephone System in Chicago

provided its Chinese subscribers with a special telephone directory in the Chinese language. The accompanying

drawing is a reproduction of one of the pages, bearing the telephone list and two of the advertisements with which the book is plentifully sprinkled.

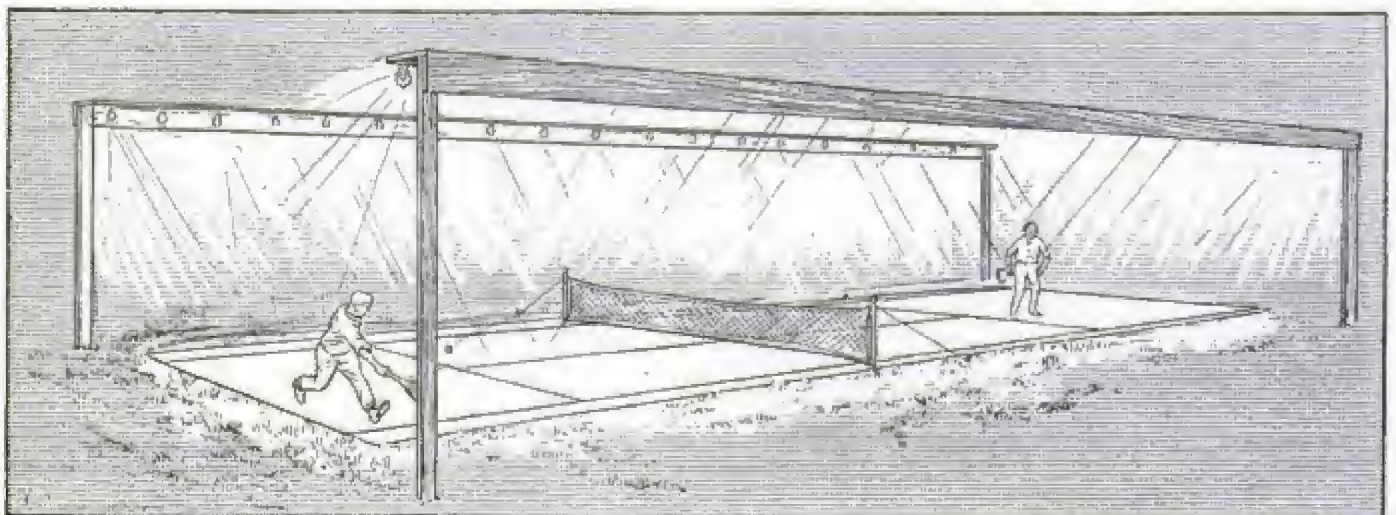
It is said that the Chinese are enthusiastic over the automatic system of telephoning, because it makes communication possible without the trouble which usually arises when a Chinaman tries to make an American telephone girl understand what number he wants.

ALUMINUM FUMES DESTRUCTIVE

A French physician has called the attention of the health authorities to the advisability of inspecting and regulating aluminum factories, of which there are a great number in his locality. His researches have shown that the gases from these factories are not only destructive to vegetation, but that the men employed in the factories are subject to a peculiar form of diabetes, which he believes is due to the same cause.

AN ILLUMINATED TENNIS COURT

By means of electric lights arranged along the sides of a tennis court, members of a Buffalo tennis club are enabled to continue their games into the night. Considerable experimenting was necessary before a satisfactory method of distributing the lights and



Playing Tennis at Night on Illuminated Court

arranging the reflectors was found. So satisfactory has this court proven, however, that a number of other Buffalo clubs intend to duplicate it next season.

vacuum distilling apparatus. The vacuum is maintained by means of a suitable air pump, and the heating is accomplished by means of two electrodes



The French Aerial Corps' Traveling Machine Shop for Aeroplane-Construction Repair Work

FRANCE HAS AERO-REPAIR MOTOR TRUCK

The aeroplane having advanced to a point where its adoption for war purposes is assured, the devising of an aeroplane tender with proper appliances is in order. The French army has recently tested out such a vehicle in the form of a huge motor truck which carries all the machinery necessary to make repairs to broken planes. The truck also carries spare parts and is so equipped that it can rebuild a broken airship and construct a new one if necessary. Expert machinists are attached to the aerial corps for the purpose of taking charge of this work.

DISTILLING METALS IN A VACUUM

Arsenic, antimony and other volatile metals may readily be separated from other metals without any oxidation whatever, according to a Schenectady, N. Y., engineer who has invented a

through which an electric current is passed. The metals distill into a receiver in the same manner that a volatile liquid would do.

FEATHER HEADDRESS SIX FEET HIGH

A remarkable example of savage headdress is shown in the accompanying illustration. It is 6 ft. in height, composed of a number and variety of feathers which must have taken considerable time and trouble to collect and arrange. It looks far more like a large and curious plant than an arrangement of feathers.





Ties Pass through the Machines at the Rate of Six per Minute and are Delivered to Truck on Adjoining Track

MACHINE FOR ADZING AND BORING RAILROAD TIES

The rapidly increasing use of creosoted softwood ties for railroad construction has stimulated the adoption of screw spikes as a substitute for spikes. To derive the greatest benefit from the creosote treatment, the ties should not be cut or chipped in any manner after having passed through the creosoting cylinders. Therefore, the ties are usually bored for the screw spikes and adzed for the tie plates before being treated, and an automatic machine has recently been invented to do this work.



Feeding Ties to the Automatic Adzing and Boring Machine

This machine prepares the tie at both rail seats for the tie plates and bores two, three or four screw holes at each end. It consists of a heavy rectangular frame, 6 ft. by 8 ft., at one end of which is mounted a long arbor carrying the two adzing heads. These are regularly spaced 4 ft. 8½ in. from center to center, but may be adjusted for any gauge of track. The cutting heads are 16 in. in diameter and of any width of face to fit standard tie plates, and the arbor is carried on an adjustable frame which is gibbed to the frame of the machine and arranged to be raised to give any depth of cut, or may be lowered to permit the ties to pass over the heads without contact.

The boring spindles, four, six or eight, depending upon the number of spikes to be used in each tie, are mounted behind the arbor carrying the adzing heads, arranged in groups of two, three or four at each end of the tie. Automatic feed is provided for the spindles, and holes up to 8 in. may be bored. The capacity is about six ties per minute.

The machine is mounted in the center of an ordinary freight car, the ties being fed to it through the door on one side and delivered out the other.

NON-EXPLOSIVE TANKS AND CANS FOR GASOLINE

By means of a new device, now being used in Europe, the explosion of tanks and cans containing gasoline, benzine, and similar explosive liquids, is said to be made impossible. The device is constructed on the principle of the Davy mining lamp, but the wire gauze of the lamp gives way to a metal tube, especially adapted for use in cans and tanks. The device is formed of corrugated and smooth strips of metal, wound spirally into a tube, as shown in the illustration, the corrugations forming openings for the flow of the liquid. These tubes are attached, within the tank or can, to the openings, and receptacles having both a spout and a filling opening are provided with two tubes, as is shown in the illustration of this type of can. The liquid stands at the same level in the tubes as in the receptacles, and, in being poured into or out of the receptacle, has to pass through them.

The principle that makes the tubes effective preventives of explosions is, as above stated, the same that makes the Davy lamp so valuable. The exceptional efficiency of the tube is due to the fact that the narrow passages acting as inlets and outlets are formed by heavy metal strips, which cool the burning gases to such an extent that the transmission of the flame from the tube into the vessel containing the liquid is impossible.

As a provision against explosion when there is a general fire in a building, the screw caps of the tubes are composed of soft solder. It is claimed that if fire should reach a storehouse containing tanks or cans of gasoline fitted with these devices, the tops would melt away before the vessels were greatly heated, exposing the gasoline in the tubes to the flames. This gasoline would burn until the tanks were empty, but the bulk of the liquid in each can would be protected and its vapors would fail to explode.

Among the tests of the device re-



Device to Prevent Explosion of Gasoline in Tanks or Cans

cently made in New York was one in which burning gasoline was poured from one can into another, also containing burning gasoline. The gases continued to burn but there was no explosion, the flame being retained in the tubes.

REMEMBERING THE WHALEMEN

In a dusty garret, on the third floor of an old cracker factory in New Bedford, Mass., Charles E. Alden, of Boston, and a former student under St. Gaudens, is putting the finishing touches upon a model which is to be reproduced in bronze and placed in



Monument Designed as Memorial to Men Who Hunt Whales

front of the public library in the old whaling town, a memorial to the men who in their pursuit of the cachelot have made the city famous.

The statue represents an old whaleman sitting upon a bitt of a whaleship. He has just picked up an iron of a harpoon and, while he gazes away, is apparently telling to a lad a story of life afloat.

A score or more real whalemen were

used by the sculptor to obtain the idea for the old whaleman's face. While it is not the face of any particular person, being rather a composite, it represents a type well known along the shores of New England.

The statue is to be exactly twice life-size. The man, if standing, would be 11 ft. tall. The accompanying photograph is from the clay model which weighs $2\frac{1}{2}$ tons.

SOLDIERS OF THE ORIENT EXPERTS IN CLIMBING

While wall scaling is a regular practice among the soldiers of all nations, it is probable that the men in the Japanese army are given the highest walls to climb. The Mikado's troopers are so well trained that the scaling of a wall 30 ft. high is no unusual task for them. A photograph was recently made of a squad of men going over such a wall. They looked like so many ants or flies as they climbed quickly to the top. While this feat is unusual,

the Japanese do not hold all the records for wall climbing. A company of Philippine Scouts of the United States army is believed to have set a mark that has never yet been equaled, when the entire organization of 108 officers and men scaled the 23-ft. city wall of Manila at a point where it was perfectly smooth, without foothold of any kind, in 1 min. 49 sec. Not satisfied with this, the same company dropped to the ground and again scaled the wall in the same place, this time taking with them the six guns of a mountain battery and going into action with the artillery on the ground on the far side of the wall in a trifle under four minutes.

200,000,000 TONS OF SODA IN AFRICAN "SODA LAKE"

"Soda Lake," situated at Magadi, British East Africa, is one of the richest soda deposits in the world, covering an area of more than 18 square miles, and containing a quantity of soda estimated at 200,000,000 tons. As fast as the blocks of soda are removed from the surface the places fill again, and the natives claim it is possible to continually work the same position for several consecutive years. With the primitive tools at hand, the lake has been sounded to a depth of about 9 ft., and nothing but crystallized soda found.

An English company, with a capital of \$5,000,000, will begin to exploit the deposit as soon as the Uganda Railway reaches the district.

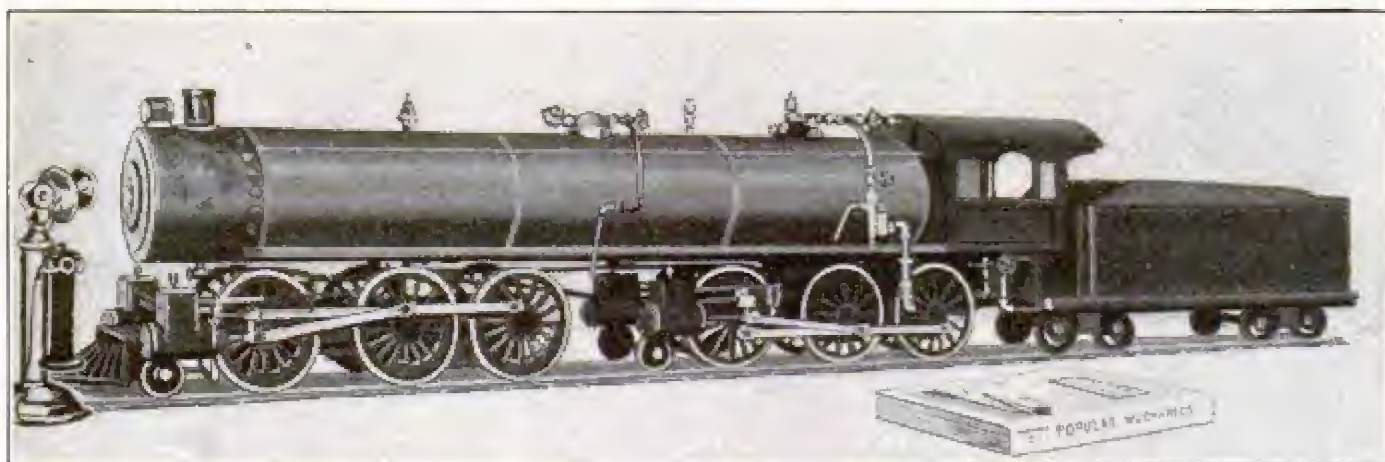


Squad of Japanese Soldiers Scaling a Wall More Than 30 Ft. High



JERUSALEM IN STRANGE GARB

As one would naturally imagine in so generally genial a climate, snow in Jerusalem is as rare as a heat wave in Iceland. For Jerusalem itself, to be covered in a white mantle, as seen in the accompanying photographs, is regarded as quite a notable event. This particular snowstorm visited the Holy City in March last. The entire city was buried two to three feet deep in soft snow. So anxious were the inhabitants to take full advantage of such an exceptional occasion that primitive sleighs were requisitioned, and the sport indulged in on the Mount of Olives.



Model Locomotive 5 $\frac{3}{4}$ Ft. Long and 1 Ft. Wide—Operated on Gasoline Fuel

WORKING-MODEL LOCOMOTIVE BURNS GASOLINE

A working model of a Mallet-principle compound locomotive, built by Dr. D. N. Jones, of Gaylord, Minn., is shown in the accompanying illustration. All work such as boring cylinders, making the truck frames, turning the wheels, etc., was done personally by the physician, the task taking five years of spare time. The engine is complete in detail and is run on gasoline as fuel, the gasoline being burned in a brazier.

The physician's idea of building a working model, which he conceived some 12 years ago, was to demonstrate that an engine could be built with a boiler capacity of any size desired, that the cylinders could be placed on truck frames with either six or eight drivers and guide wheels, and that such a locomotive could take any curve or siding any ordinary switch engine can make. The trucks are pivoted and the engine will make the shortest curve allowable with the rigid wheel base of one set of drivers.

The boiler of the working-model locomotive is made of high-pressure steam pipe, 8 in. in diameter, with ends and flue of ordinary construction. The total length of locomotive and tender is 8 $\frac{3}{4}$ ft.; the length of the boiler, 5 $\frac{1}{2}$ ft. Other dimensions are: Gauge, 5 $\frac{3}{4}$ in.; drivewheels, 8 in. in diameter; width of cab and tender, 1 ft.; weight of locomotive and tender, 400 lb.; boiler capacity, 8 gal. of water; steam pressure, 225 lb.

SPECIAL TRANSFORMER FOR PHYSICIANS

A French inventor has designed a dynamo transformer which is capable of turning out, simultaneously if desired, currents of various tensions and strengths. In its present form it is adapted for the use of physicians, is simple in principle and construction, and self-regulating under varying loads.

Fed by a 110 to 220-volt current, it can give, all at the same time, direct currents of 25 volts at 9 amperes, for charging accumulators; 12 volts at 7 amperes, for lighting purposes of various instruments; 14 volts at 40 amperes, for cauterizing instruments; and alternating current for hydroelectric baths. Being self-regulating under varying loads, it gives the same intensity whether, for instance, one or more cauterizers be used, or whether providing current for one or several of the purposes mentioned.

NEW BIG-GUN ARRANGEMENT LIKE OLD

It is interesting to note in these two battleships how naval architects of today are going back to old ideas in gun arrangement, etc. One of these ships is the old British battleship "Colossus," and the other is the new "Colossus," one of Great Britain's latest dreadnoughts. In examining the new ship it will be noted that the designers have gone back to the "Colossus" of 1882 in the arrangement of



H. M. S. "Colossus" of 1882



New "Colossus" Has Four Big Guns Arranged in Same Manner as on Predecessor

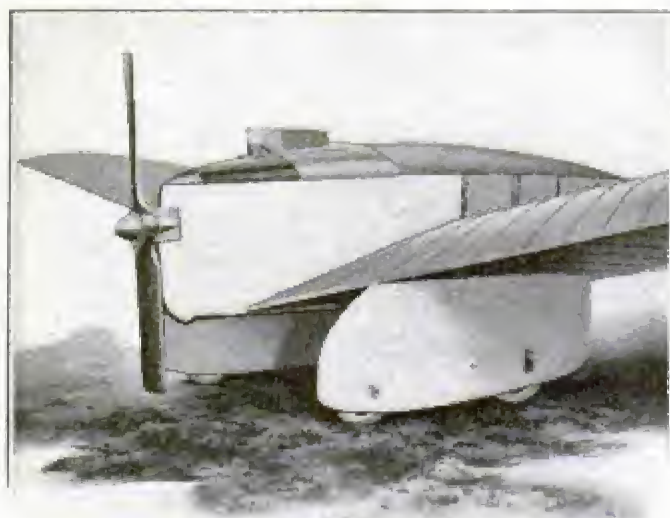
AN ODD SIMILARITY OF BIG-GUN ARRANGEMENT ON BRITISH BATTLESHIPS
OF TWO GENERATIONS

four of the 12-in. guns, they being placed "en echelon" on port and star-board beam.

constructed, and is most suggestive of what many believe to be the coming type.

NEW ANTOINETTE AROUSES INTEREST

A new monoplane just completed by the designers of the Antoinette aeroplane is arousing great interest in Europe. The most remarkable features



Front View of the Antoinette; Even the Wheels are Inclosed as Much as Possible

of the new machine are the complete elimination of all exposed stay wires, and the covering-in of all elements in the structure to produce streamline forms, adapted to pass through the air with minimum resistance.

The span of this machine is over 52 ft. and the chord of the wings from 10 to 13 ft. It weighs 2,500 lb. The motor is of 100 hp. This is the largest and heaviest successful aeroplane yet

BRIGHT LIGHTS ATTRACT THE SHOPPERS

Shoppers buy their goods from merchants living on the best lighted side of the street. This peculiar item of business philosophy has recently been announced by an illuminating engineer after an exhaustive study of the matter, which included observations extending over a number of cities. It is stated that in a certain Canadian city the fact that one side of the street was better lighted than the other caused the increase of rentals on that side to as high as 50 per cent greater than on the poorly lighted side. The fact that the lighting had something to do with it was proved to the satisfaction of the investigator when some of the merchants on the darker side caused the installation of special lighting facilities near their places of business with the result that their business increased to an extent that enabled them to pay for the installation out of the extra profits.

¶The people of Australia are building a Federal capital, which, if present plans are realized, will be one of the most magnificent cities in the world in point of architectural and landscape decoration.



Side View of the New Antoinette Monoplane, Showing Form of Planes and Inclosed Body



Side View of the Absorber, Showing the Arrangement of the Water-Feed and Steam Pipes

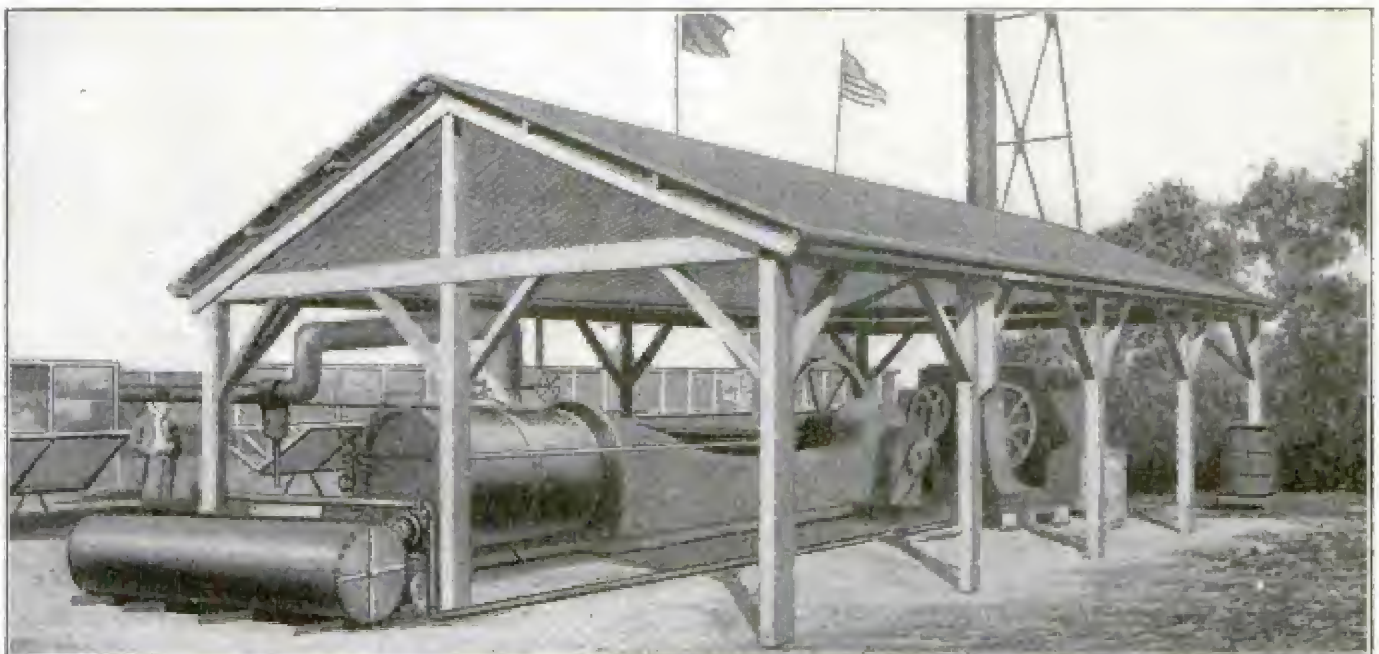
SUN'S POWER OPERATES PUMPING PLANT

After many years of experiments and failures, an American inventor of apparatus designed to utilize directly the sun's power has perfected an apparatus which has been in operation in Philadelphia. The machine was kept running steadily for several weeks, and during that time pumped several millions of gallons of water by power obtained from the sun's rays alone.

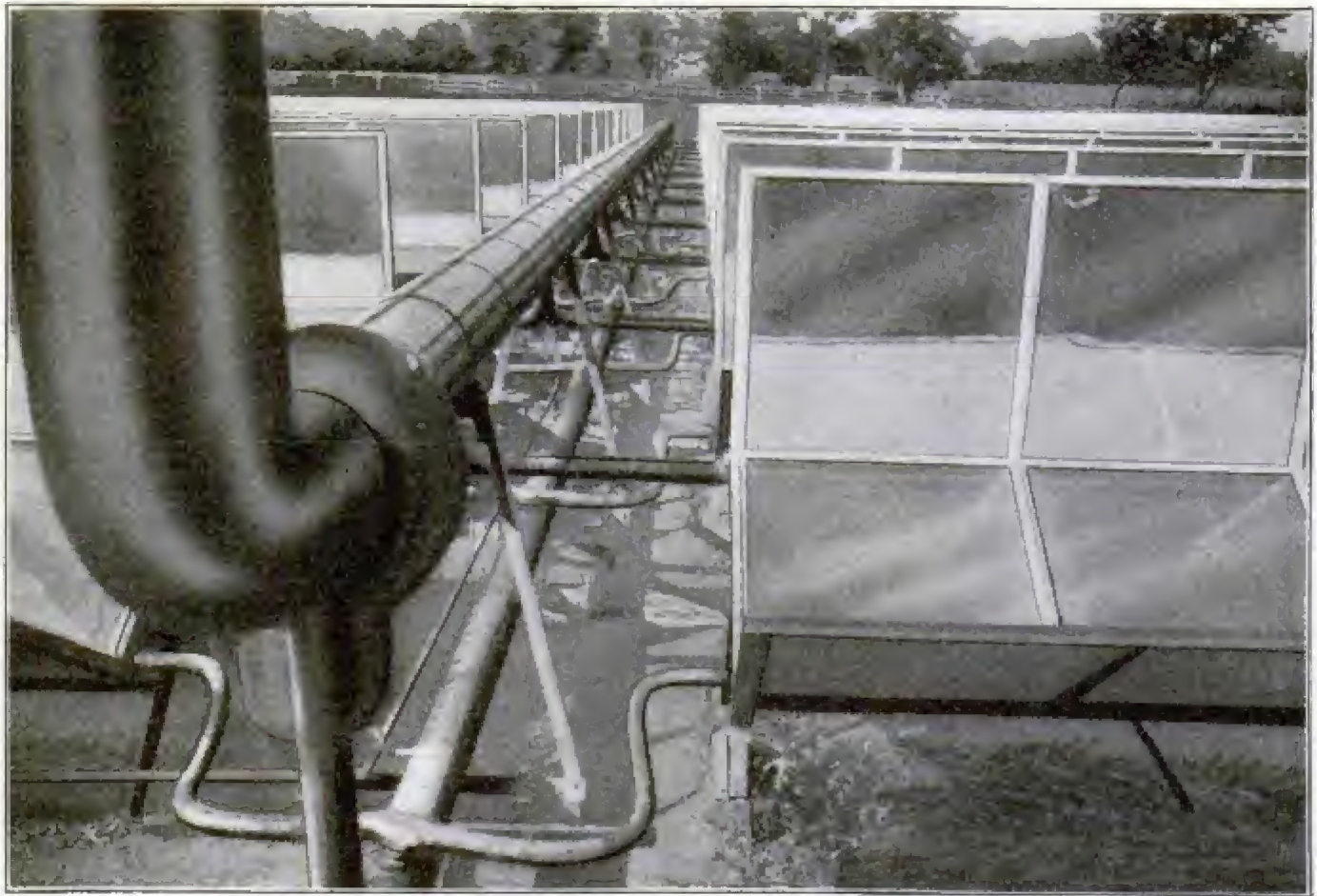
The plant at its present stage of development consists of an absorber, a low-pressure steam engine, condenser and auxiliaries. The absorber is composed of a series of units, each containing a flat metal honeycomb water vessel, rectangular in shape and closely resembling a large waffle. This vessel is inclosed in a flat wooden box

covered with two layers of glass having a 1-in. air space between them. The under side of the box is insulated against heat loss downward by a 2-in. layer of cork and two layers of water-proofed cardboard. The boxes are mounted on supports which elevate them about 30 in. above the ground, and permit of their being inclined perpendicularly to the sun at noon. The adjustments of inclination have only to be made once in three weeks.

Mirrors of cheap construction are mounted on two sides of the boxes so that more rays may be caught, reflected upon the surface of the water vessel, and absorbed. The water vessels are connected at one end to a feed pipe from the water supply, and at the other



The Pumping Plant Operated by Steam Generated by the Rays of the Sun



View Showing Glass Absorbers and Mirrors and Well Insulated Pipes to Retain Heat

end to a steam pipe. The steam pipes from the various units are connected together and empty into an 8-in. main which conveys the steam to the pumping engine.

The pumping engine is a new type, low-pressure, reciprocating engine of great steam economy. Connected with it is a surface condenser of ordinary type and auxiliaries such as may be found in any condensing plant. The water from the condenser is pumped back into the absorber. The pumping capacity of the plant in the latitude in which it is at present located is 3,000 gal. per minute lifted to a height of 33 ft., or approximately 25 hp. The apparatus is to be taken to Egypt and tried out as an irrigation engine.

☞The people of Germany are the greatest users of the post card for inland correspondence in the world, 1,548,500,000 cards having been used in the Empire last year, while Japan used 860,000,000, the United States 855,579,000 and Great Britain 838,500,000.

NEW METHOD OF SEALING CANAL DIKES

A new method of utilizing concrete to seal canal dikes against leakage, without necessitating the drawing of the water from the section of canal being repaired, has been successfully adopted in Europe. It consists of the building up of a thin concrete cut-off wall in the dike, sheet-piling being used to make the narrow trench or slot for the concrete. A short section of sheet-piling is first driven to a depth of about 8 ft., and then the piles are drawn one at a time, great care being taken to prevent soil from being knocked into the hole thus formed. A steel funnel, shaped to enter the hole, protecting the sides and edges, is next inserted and fed with concrete mixed quite dry. The concrete is tamped in place with a long-handled ram, the form is redrawn, and the process is repeated with the next pile. The redrawn piles are cleaned and moved ahead to be used again.

The Kingdom of Dust

By J. Gordon Ogden, Ph. D.

THIS is the tenth and last of a series of articles by Dr. Ogden, professor of physics at the Fifth Avenue High School, Pittsburg, Pa. In every home, in every office, in every shop or factory, the fight against Dust is never-ending. Dr. Ogden illuminates this subject in a manner which brings a realization of its infinite importance.

X—The Wonders in the Dust

WE ARE more or less familiar with the great natural wonders of the earth on which we dwell. We have seen mighty oceans, thundering Niagaras, stupendous glaciers, magnificent rivers, tremendous volcanoes with their lakes of molten rock, immense caverns hung with snow-white stalactites, great cañons cut out of the living rock, lofty mountains crowned with eternal snow, and beautiful valleys decked with the myriad forms of plant life. Aided by the magic of the telescope, we have looked far into the abysses of space, and have seen the shining glories of sun, and star, and planet. Spellbound, we have watched the birth and death of worlds and solar systems similar to our own. We have gazed upon the faintly glowing nebulae far away in the infinite realms of the starry heavens, and have been impressed with their grandeur and our own insignificance.

And yet, after all, these marvelous things are but a few of the wonders of the universe. The microscope, with its wonderful eye of crystal, rivals the telescope in its power of revelation. A handful of dust is as wonderful as a solar system if we rightly interpret the evidence it presents of use, perfection of design, and the working out of laws that are as stupendous and eternal as those that brought forth a Sirius or a Pole Star. As a matter of fact, a continent is simply a combination of certain subjects of the Kingdom of Dust, while the sun itself is naught else than a glorified multiplication of dust units.

Let us, then, pick up a handful of dust, here and there, place a few particles under the objective of a powerful microscope, and become familiar with some of the "Wonders in the Dust."

The first handful we take from the ooze at the bottom of mid-ocean. It is a slimy, disagreeable mass of mud, when viewed with the naked eye. Under the microscope these deep-sea dredgings resolve into the most beautiful forms imaginable. They are really the shells of minute organisms, vegetable and animal, and are made up of tiny bits of lime or silica woven into forms of exquisite beauty and coloring. Millions and millions of these fairy-like creations have been determined in a single cubic inch of ooze! Each of these mites of creation is as perfect, complete, and individual as an oak or an elephant. Delicate domes are here, more wonderful than Michael Angelo's famous dome of St. Peter's. Windows and door-ways, made from sand or lime, far more beautiful than those of any cathedral wrought by the hand of man. Palaces rich in ornament and tracery, formed from the dust in the water, by animals and plants without a vestige of brain, lie desolate upon the bottom of the sea, abandoned ages ago by the tiny inhabitants. Structures more marvelous in their sculptured witchery than the famed Colosseum, the Pantheon, or the Taj Mahal, are buried in the ooze and slime at the bottom of every sea. Exquisite creations, infinitely more graceful in de-



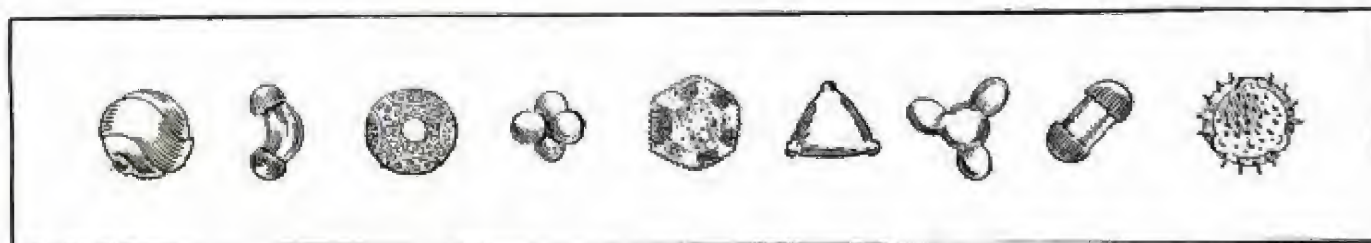
Photomicrographs of Frost and Ice Crystals

sign than the storied marble of a Phidias or a Praxiteles, lie in wanton waste in the foul mud of the ocean depths.

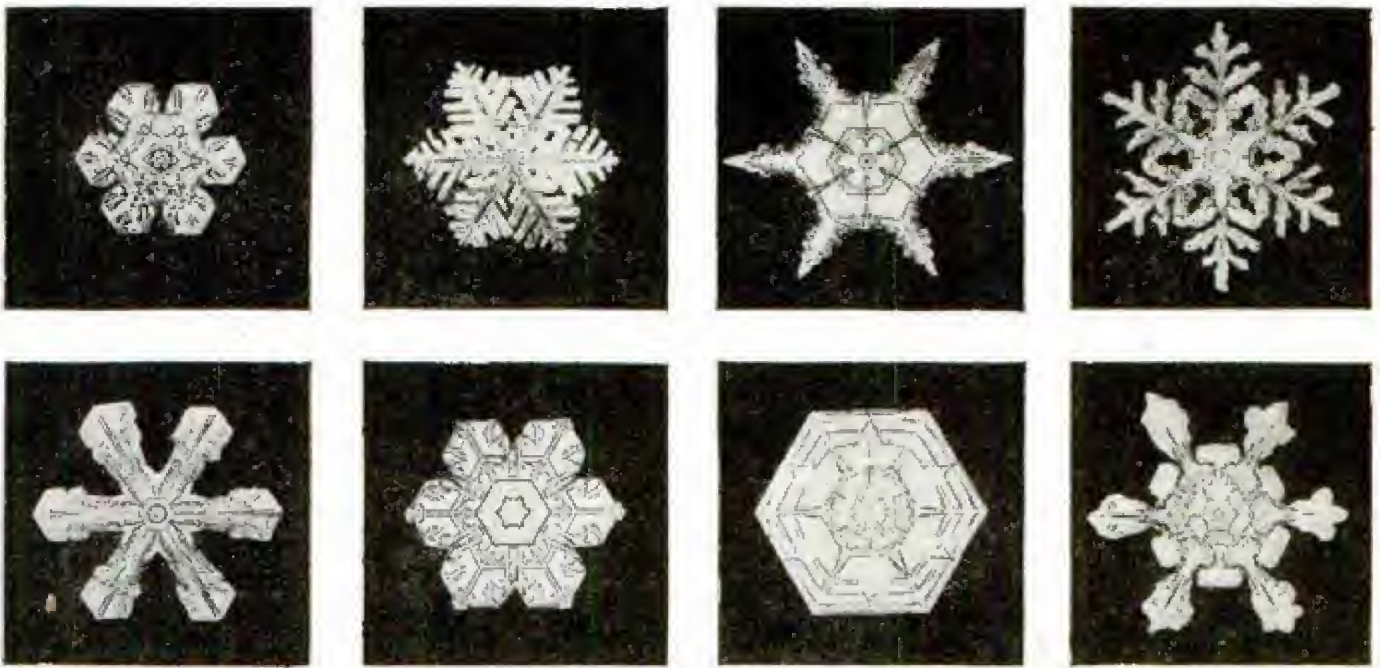
Let us take another handful of dust from garden and meadow. Under the microscope we find this to contain thousands of curious forms known as pollen grains. It is a well-known fact that practically all the flowering plants emit from their anthers a powdery dust that is of vital importance in the life history of the vegetable kingdom. These pollen grains are carried either by insects or by the wind to the stigmas of other plants, or of the same plant. Here they at once proceed to send long tubes down to the ovules hidden away in the lower part of the pistil, and fertilize them into true seeds. While the whole process is wonderful, it is the variety and beauty of form displayed by the various pollen grains to which we would especially ask attention. The illustration shows a few of the many different

kinds. Some of the grains are perfect globules, others are cubes or ovals. Some are wonderfully lobed or have bladder-like appendages to assist in the transportation of the pollen by the wind. Some are covered with bristly points like diminutive spearheads. Others have delicately wrought smooth bands or spiral groovings. So specific are these markings that it is possible to recognize many plants by the pollen alone. They are as characteristic and individual as human beings themselves, and yet, they are after all but insignificant motes of dust.

For our next handful, let us scrape off a few bits of the weathered granite, limestone, and sandstone of any mountain side. Let us take them to the laboratory and grind the tiny fragments so thin that we may see through them. Under the microscope, these paper-thin rocks tell us all about themselves, and their story is wonderfully interesting. Even the mountains, so say the rock sections, are subjects of the



Pollen Grains (Greatly Magnified) Assume a Wonderful Variety and Beauty of Form



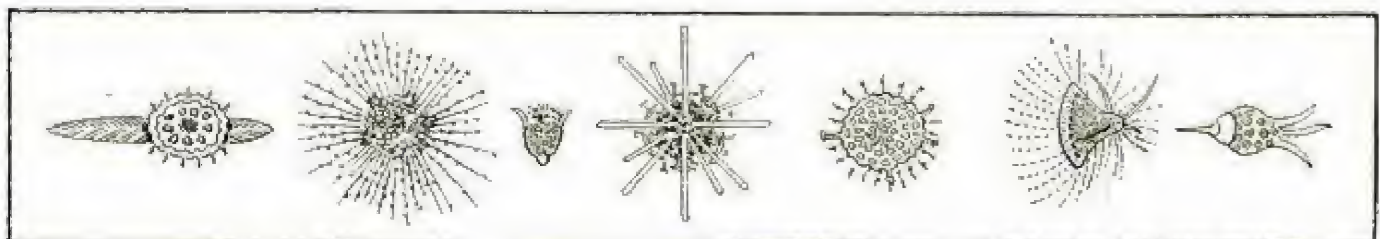
Photomicrographs of Snow Crystals

Kingdom of Dust. These delicate films of rock enable us to look directly into one of nature's private laboratories, and we see the various particles of quartz, mica, feldspar, limestone, hornblende, and other rock material summoned from the disorder and chaos of the dust heap and marshaled into the beautiful and symmetrical forms that are known to us as crystals.

And now we must digress a little from the main subject in order that we may review our knowledge of the wonderful process known as crystallization. If we place a few grains of sugar in a small quantity of water, and let the mixture stand undisturbed for a few days, a queer thing takes place. Slowly but surely each tiny particle of sugar, moving about in the solution, makes overtures to the other particles looking to a combination. If a thread be placed in the concentrated liquid, the process of crystallization goes on apace. Little by little the opaque sugar, particle by particle,

takes hold of the life line thus thrown to it, and attaches itself either to the thread or to other particles that have already gained a hold upon it, and forms crystals, beautifully symmetrical and transparent.

Imagine a mob of men running wild over a vast field. Suppose that these men were suddenly to fall into line like well-trained soldiers. Suppose that these individual men were to form, at the word of command, into the most perfect geometrical figures, star-shapes, pyramids, squares, hexagons, octagons, or even cubes, bounded by lines and angles that are mathematically perfect. Suppose, also, that some of these men, wonderful to relate, should become perfectly transparent or translucent, either colorless or tinted a beautiful violet, blue, green, lavender, orange, pink, or brown, and that others should remain opaque. Would not all this be ridiculed as an impossibility or the dream of a poet? Nevertheless it is precisely what hap-



Minute Shells, Microscopic in Size, Dredged from the Ocean Bottom

pens when certain substances are permitted to dissolve and to follow the unerring laws of a sovereign of which they are the liege men.

Anyone may readily become familiar with the many curious facts that are associated with the phenomenon of crystallization. Practically all of the household chemicals, such as sugar, salt, baking-soda, washing-soda, copperas, cream of tartar, etc., will answer the purpose. Dissolve any of these substances in a small quantity of boiling water, and let the mixture cool and slowly evaporate. In a few hours or at most, in a few days, characteristic crystals will form, more beautiful than any illustration that could be put on printed page. If all the substances are mixed and dissolved, crystallization will go on just the same. Each of the salts will form separate communities of crystals. Each sort will seek its own kind with something that is marvelously akin to intelligence. If we enlist the chemist's aid in our search for crystal material, and secure other chemicals, such as blue vitriol, bichromate of potassium, alum, hyposulphite of sodium, and nitrate of silver, we shall add greatly to the beauty and completeness of our home-grown collection of crystal treasures.

In all this wonderful world of ours there is surely no process more wonderful than that of crystallization. If architecture is "frozen music," as Madame De Staël so aptly said, then crystals must be frozen thought. Their study opens up an enchanted realm wherein fairy princes, gnomes, and dwarfs work their will, building beautiful things out of the lowly dust. In many respects a crystal in its life history resembles a human being. As Ruskin pointed out, long ago, there are crystal virtues, crystal faults, crystal quarrels, crystal joy, and crystal sorrow, if we read aright the messages the crystals have left for prying mankind to interpret and understand. They tell us of ambition, emulation, caprice, activity, rest, weakness, strength, pride, success, and failure.

Do we find much more than this in the life story of the average man or woman?

Let us take our next handful of dust from the black muck and slime of a swamp or bog. Surely nothing else could be more uninviting. Instinctively we associate it with death and decay, forgetting the ancient delights of mud-pie days in the long ago. And yet, this muck and slime has a story to tell, just as marvelous as that told by the deep-sea dredgings. Besides the water present, there are at least four different materials in this handful of "filth" from the bog. The surprising part of it all is that no one would ever imagine that these substances were there, after we have sorted them out and told the story of their possibilities.

The mud contains tiny particles of iron, clay, sand, and soot, or carbon. How did the iron get there? Have you ever noticed an iridescent film shining on a pool of stagnant water in a woods? Undoubtedly you have, and thought it to be a scum of oil. On the contrary, this film has nothing whatever to do with oil, but owes its presence to tiny particles of iron oxide that were leached out of the surrounding soil, carried by little threads of water trickling through the forest floor, and deposited in a pool where it eventually was laid down as bog iron ore. Billions of tons of iron ore have been deposited in this manner throughout the earth's crust. Therefore, the first of the wonderful things that we are to notice in this handful of muck is iron with all its potentialities of steel steamships, skyscrapers, bridges, boilers, and rails that will one day crisscross a continent.

Let us now consider the next ingredient in our handful of mud,—the clay. The clay is the plastic substance that we readily detect by kneading the mass with the fingers. Crystallization will work wonders with this sticky, coherent substance. Obeying the wonderful law of unity, as Ruskin has told us, the clay particles will sepa-



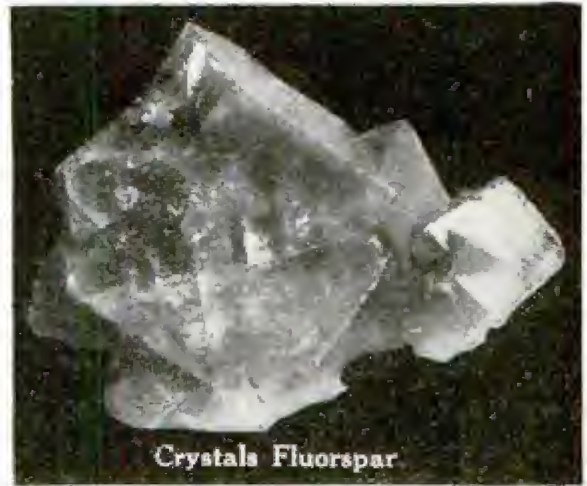
Crystals—Black Tourmaline in Quartz



Quartz Crystals



Crystallized Sugar—Rock Candy



Crystals Fluorspar

Various Crystals Built from the Dust

rate from the other constituents and form the beautiful white material from which our finest porcelain and china-ware are made. More than that, if left to itself, the clay may crystallize into a substance that is harder than flint, and of a beautiful red, green, or blue color—a ruby, emerald, or sapphire.

The gritty substance in the mud is sand, and when this substance likewise enters the mystical crystal kingdom it forms the precious opal. The carbon, not to be outdone by the clay and sand, casts aside its mantle of sooty darkness, and through the magic power of old Mother Nature, may become a diamond. This handful of dust, then, has turned out very well, in that it has given us iron, the most useful of all the metals, and a handful of the rarest gems—and all from the mud we are so careful to avoid lest we soil our shoes or clothing with it!

Let us take one more handful of dust and "tell its fortune." This time let it be water-dust—snow is its ordi-

nary name. Everyone, surely, is familiar with the exquisite beauty of the snowflake. Formed as they are on the general plan of a hexagon, no one ever saw two snow crystals precisely alike. Nature sends out billions and billions of her snow handiwork, but every copy is an individual and peculiar one. She delights in variety, and truly the snowflakes are not the least of the "Wonders in the Dust." Even in a cake of solid ice one may see the delicate, beautiful snow flowers packed closely together, for the ice is simply one mass of these marvelous products of nature's art gallery.

Floating lazily in the clear blue reaches of the sky are other examples of the wonders of water-dust. The glorious clouds, like fabled castles filled with dream folk, are either tiny drops of water, or minute crystals of ice soaring far above the busy world below. Sometimes these ice crystals cover trees, window sills, and grass with their beautiful spicules of hoarfrost, and everyone knows what a fa-

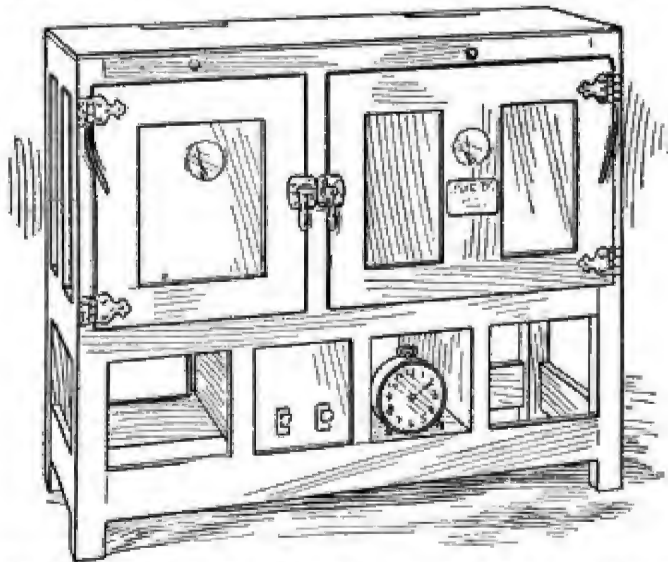
mous artist Jack Frost is in the matter of window ornamentation.

One other thought, and then we are done with the Kingdom of Dust. The problem of food supply is becoming a serious one for mankind. We have been lavishly using the guano, phosphates, and other fertilizers that nature has given us, along with other priceless heritages such as wood and coal. The time is fast approaching when we shall either have to face starvation or else evolve some new source of food supply. Every day the problem becomes more insistent. What is the solution? Clearly we must wrest from nature one of her

simplest and yet most carefully guarded secrets. We must go down into the dust, study the ultimate atoms that compose it, and learn how nature combines a bit of soot and a few raindrops, thereby giving us that wonderful substance, sugar. We must learn how she manufactures that life-sustaining compound, albumen, from carbon, hydrogen, oxygen, nitrogen, and a trace of sulphur. Her chemical magic, her marvelous constructions of complex molecules from simple atoms, her power to change the stone into bread, are secrets that lie hidden somewhere within the mighty Kingdom of Dust.

AUTOMATIC ELECTRIC FIRELESS COOKER

A new automatically operated electric cook stove, manufactured by a concern in Flint, Mich., employs the fireless principle of operation, the heating elements of which are inclosed in ther-



An Electric Fireless Cooker Whose Operations, Both in the Throwing On and Off of the Heat, are Automatically Controlled

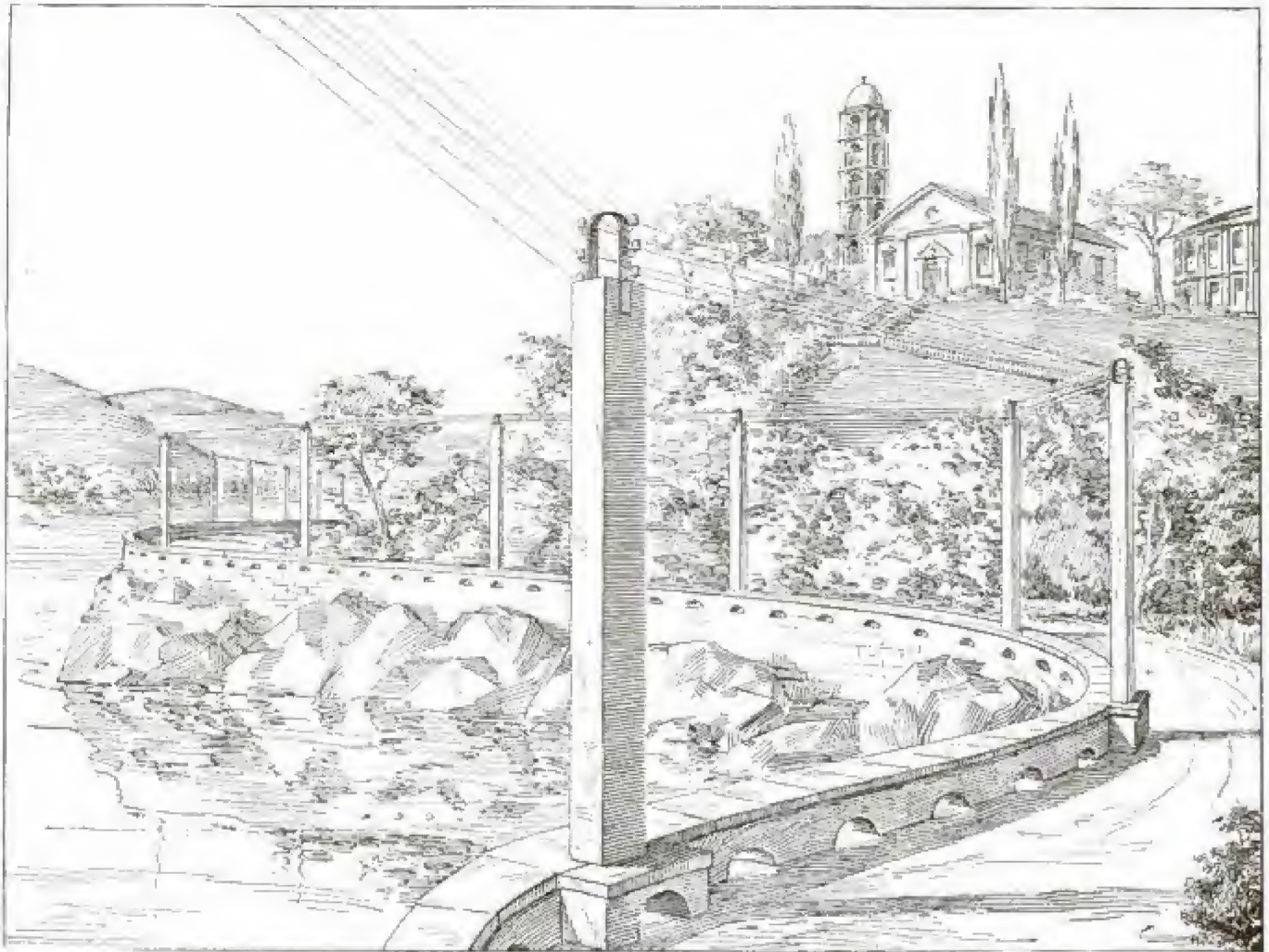
mally insulated compartments, and cut off automatically when the ovens have reached the predetermined temperatures for the cooking operations required.

The installation comprises two separate cooker ovens, one for boiling and the other for baking and roasting. Each oven is fitted with a dial-type thermometer, the pointer of which, upon making contact with an adjust-

able hand, momentarily closes an auxiliary circuit, tripping out the heater switch. The temperature at which the heating element is thus disconnected can be set at any desired point by means of the thumb-controlled contact pointer. For the boiler the cutting-out point is ordinarily set at 212 deg. F., and for the roasting oven, at 375 deg. After the temperature required to operate the cut-out has been reached, the cooking proceeds with the heat already stored in the oven, the stove thus becoming a fireless cooker.

By reason of the alarm clock provided, the housewife may place the articles to be boiled, baked or roasted in the stove, and go away for the afternoon, knowing that the oven will begin heating at the time she has set the alarm. When the alarm operates, a lever on the winding key throws a switch closing the circuit to the heating elements. Later, when the predetermined temperatures have been reached in the ovens, the circuit is broken, and the ovens go on cooking with the heat they have stored up.

☞ Australia is rapidly coming to the front as a wheat-producing country, there having been a yield of 24,344,740 bu. during the past season from 2,104,717 acres of land, an average of 11.57 bu. per acre.



Old Swiss Road, Built by the Romans, Lined with Granite Telegraph Poles

GRANITE TELEGRAPH POLES IN SWITZERLAND

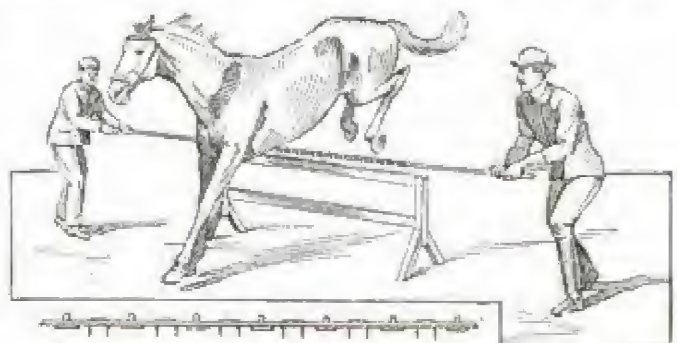
The great abundance of granite rocks and the lack of timber in the southern part of Switzerland has led to the employment of the former for purposes usually filled by the latter. Thus, in many sections of the southern country, the fences are of granite instead of wood, the supports for the

grapevines are granite posts, and pavements, etc., are of granite. Perhaps the most striking departure from the ordinary, however, is the use of granite pillars in place of the usual wooden telegraph, telephone and electric-power transmission poles. Near Lake Como and Lake Maggiore the old highroads originally constructed by the Romans are fringed with granite pillars 18 ft. high carrying telegraph wires.

RAPPING BAR USED TO TRAIN JUMPERS

The device shown in the drawing, called a rapping bar, is used successfully in the Russian army in schooling horses to jump obstacles without brushing or tipping them with the hoof. Two attendants hold the bar at the same height and about six inches or a foot beyond the obstacle to be jumped. If the horse ridden over the jump touches with fore or hind feet,

the attendants quickly raise the rapping bar six or seven inches and the



The Rapping Bar in Use

animal gets a sharp rap on the legs from the short blunt points of the copper rivets and from the bar itself.

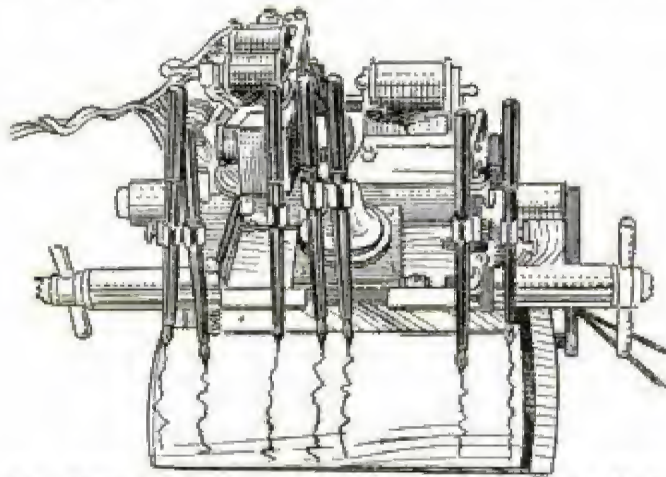
The rapping bar is a light pole, 10 ft. long, 2 in. in diameter, wound with leather straps studded with $\frac{3}{8}$ -in. copper rivets. When the bar is raised and struck by the horse, it should be let go by the attendants, the punishment then being about equivalent to

striking a stiff hedge; enough to make the horse jump clear next time, but involving no injury or cruelty.

At the recent horse shows in Europe, the honors in the jumping contests were practically monopolized by the French, the Russians, and Belgians, who consistently and systematically school their horses to the jumps by various methods.

CHRONOGRAPH FITTED WITH FOUNTAIN PENS

Fountain pens are used in connection with the recording apparatus of a dynamometer car used for brake tests by a large Pittsburg manufacturer of air



The Seven Fountain Pens of This Chronograph Make a Continuous Record of Various Performances of Interest in Train Operation and Air-Brake Control

brakes. The chronograph, or recording apparatus, consists of an electric motor and a series of gearings through which is driven a roll of paper 9 in. wide. Upon this roll of paper is automatically recorded the various performances of interest in train operation and brake control, including the speed in miles per hour, the revolution of wheels under the dynamometer car, time movements at half-second intervals, position of reverse and throttle levers, train-line air pressure, brake applications, etc.

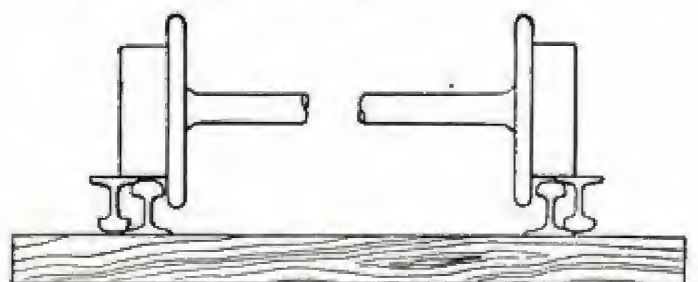
The recording apparatus can be so adjusted as to record any or all of the events enumerated to meet the requirements of the test desired, the records of the various events being registered through means of indicators and mag-

nets, and a permanent continuous record inscribed on the roll of paper by means of the fountain pens. Seven fountain pens and the manner of mounting them are shown in the accompanying illustration.

EXTENDING CONSTRUCTION TRACK WITHOUT RAILS

In extending the temporary or working track in tunnel construction, short lengths of rail are usually employed, and the track layers are apt to put the ties in carelessly with the intention of fixing them properly when the permanent rails are placed.

By the method shown in the illustration, the ties are placed permanently the first time and full-length, regular rails are used. The ties are laid as near the face of the cut as advisable, and two full-length rails are placed on the outside of the last set of regular rails. Then a track spike is driven in at both ends of the lap of each pair of overlapping rails to keep the new rail against the old, and the track is ready for the car. As the heading advances the rails are slid forward, and when the ends are reached they are turned over and spiked in place.



Courtesy Engineering and Contracting
Sectional View Showing Method of Extending Tunnel Track

PNEUMATIC-TUBE SERVICE TO CARRY MONEY

The Secretary of the Treasury proposes to establish in the near future a pneumatic-tube service between the Bureau of Engraving and Printing and the Treasury Department, a distance of six city blocks, for the transportation of millions of dollars of paper currency, stamps and securities. The transportation is now accomplished by means of big steel vans, guarded by half a dozen armed men and a number of mounted guards. No attempt has ever been made to hold up these vans, but the underground tube is considered advisable more for economic reasons than as a precaution against robbery.

COMBINED TELEPHONE AND LAMP STANDARD

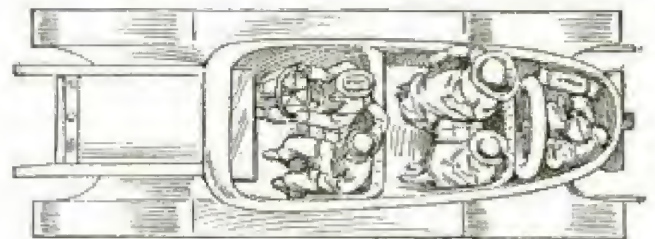
A desk telephone and lamp standard in one is shown in the accompanying illustration. The unique feature lies in the fact that the transmitter is located in the top of the shade, the shade also serving to gather up the sound of the voice and concentrate it upon the transmitter. The idea has been patented. The shade would have to be tilted rather close to the face to make transmission of the voice at all clear, and this would throw the direct glare of the light on the person using the instrument.



Telephone Transmitter and Electric-Light Shade Combined

ENGLISH SUGGESTION FOR DIS- POSAL OF CHAUFFEUR

The problem of what to do with the chauffeur or mechanic when the owner wishes to drive his own machine



Courtesy Motor, London

Closet-Like Space at Rear of Open and Closed Type of Automobile for Luggage and for the Chauffeur When the Latter is Not Driving

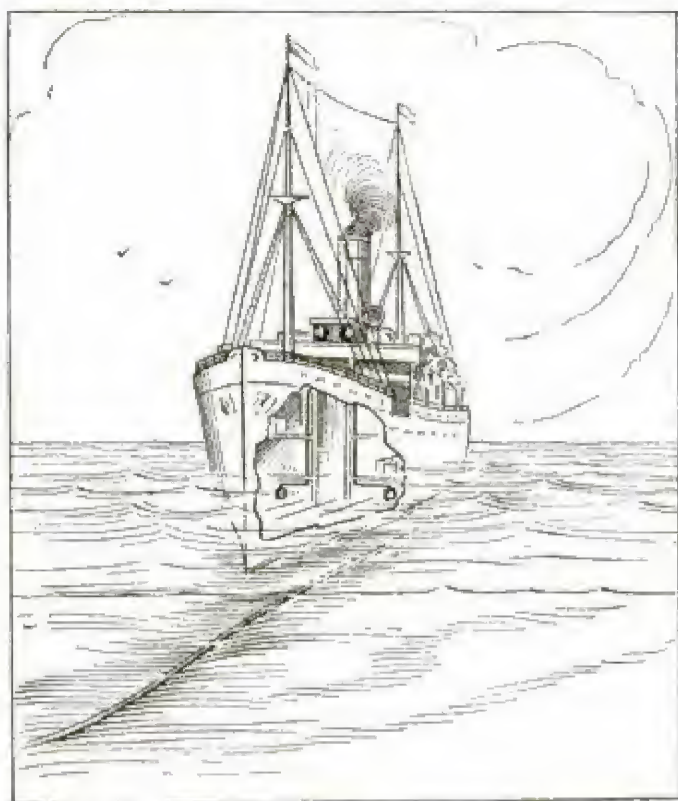
has not yet been successfully solved, although the demand that a type be evolved in which the best part of the car is not turned over to the chauffeur grows more persistent. In the accompanying drawings, however, is shown a British suggestion for the disposal of the spare wheel, the baggage, and the chauffeur that can be applied to either an open or a closed car. This idea embodies the continuation of the streamline type of the body to form a closet-like space at the back of the car sufficiently large for a mechanic's seat and small luggage.

RELATIVE ENERGY OF RADIUM

At a recent meeting of scientific men in England, Sir William Ramsay made the statement that if the energy of a ton of radium could be accumulated and used, it would suffice to propel a ship of 15,000 tons with engines of 15,000 hp. at the rate of 15 miles an hour for 30 years. At the present day such a ship would require 1,500,000 tons of coal.

GUIDING VESSELS BY ELECTRIC IMPULSES

Two or three years ago a marine engineer proposed to string a line of electric lights along the channel of a



Vessel Equipped with New Submarine-Signal System

river, sound or other marine passageway as a means of guiding vessels through fog or darkness. Nothing more has been heard of this scheme, but now comes the idea of laying an electric cable to guide ships by means of electric impulses instead of electric light. In this plan each vessel is to be equipped with two receiving instruments, one at each side of the hull. Both instruments are tuned to respond easily to the impulses sent through the cable. If the vessel is directly over the cable, the sound of both instruments would be equally loud, but, if off to one side, the instrument nearest the cable would be stronger, thus notifying the officer in command that the vessel has swerved from the correct course.

A cloth is made from raw silk in China which can be buried underground a year without deteriorating in the least.

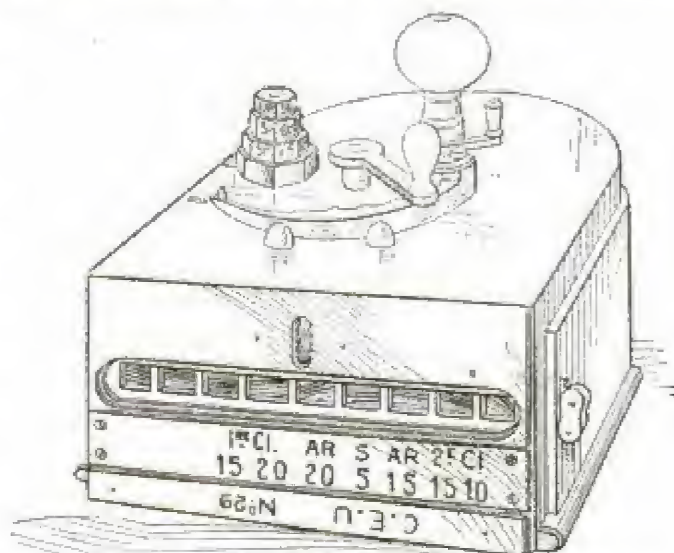
ELECTRICITY TO DESTROY THE CODLING MOTH

Electrocution of the codling moth is the latest method adopted to protect the trees by the apple orchardists in Spokane valley and the various parts of eastern Washington. A demonstration of the practicability of the idea was made last August in a 6-year-old orchard at Opportunity, Washington, and great numbers of second-brood moths and green aphids were killed in a few minutes.

In this test the current was provided by storage batteries, but where electric-light wires are extended to the orchard tracts, as in Spokane valley, the expense of batteries is saved. The electrocution weapon consisted of incandescent light globes of 6 cp., netted with fine steel wires, coated alternately with copper and tin. Attracted by the bright lights in the trees, the moths flew against the network, completed the electric circuit, and were instantly electrocuted.

FRENCH AUTOMATIC TICKET-DISTRIBUTOR

One of the omnibus companies of Paris has adopted a small portable fare-registering machine which delivers tickets or receipts when the fare is paid. It stamps the various first and second-class tickets for the single sec-



Fare Register and Ticket Distributor Adopted by Paris Omnibus Company

tions or the whole distance, and also indicates the route on which the ticket is used, the section at which the passenger entered the omnibus, the hour and the minute, the date, the number of the ticket, and the number of the apparatus which delivered the ticket. Counters automatically give the exact number and the total price of the tickets delivered for the whole day.

"TAILOR-MADE" GUNS

The best British-made sporting guns, designed to last a lifetime, and costing anything from \$250 to \$500, are usually built to fit the buyer, and in this respect resemble tailor-made clothes. The correct fit, however, is not obtained by intricate measuring of the person of the buyer, but by means of a "try gun" of the type shown in the accompanying illustration. This gun can be twisted and altered to practically any shape and length, yet can be fired in

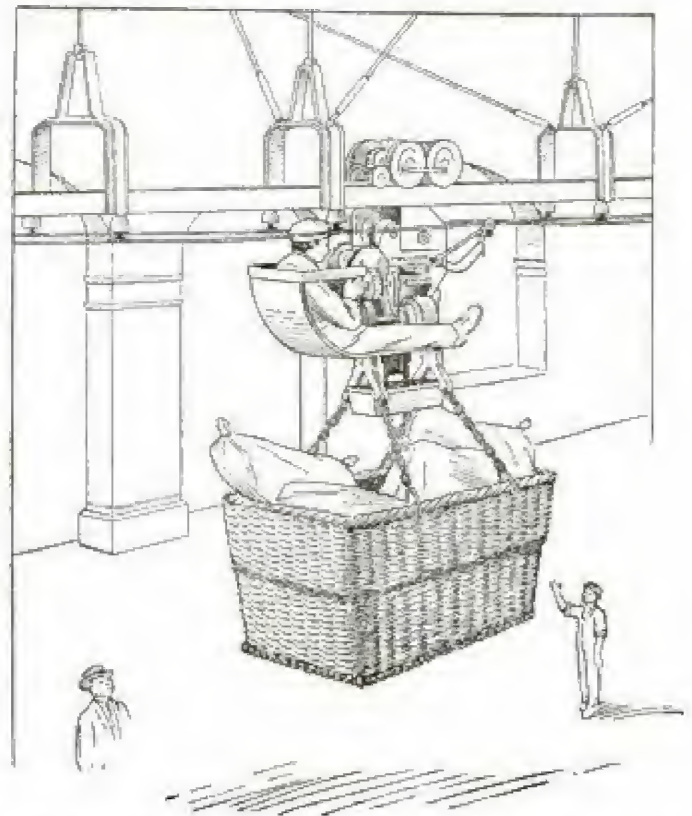


A Gun Which can be Twisted and Altered as to Shape and Length, Used for the Purpose of Obtaining the Correct Fit When Making a Gun for a Customer

exactly the same manner as an ordinary weapon. The purchaser desiring a made-to-order gun is provided with the "try-gun" and taken to the testing range, where he twists and alters it until he is satisfied with the way it fits.

ELECTRIC BAGGAGE TROLLEY IN RAILWAY STATION

An electric trolley or telpherage system has been installed in the Victoria station in Manchester, Eng., for the transportation of light baggage and parcels between the parcel office and the train platforms. The elevated runway consists of a pair of flat steel bars, 12 in. apart, and forms a continuous loop, 2,448 ft. long. The traveling hoist is suspended from the runway

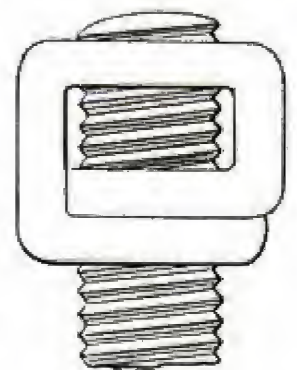


Electric Traveling Hoist Handles Light Baggage in English Railway Station

by a four-wheeled truck, and the operator rides in a hammock seat suspended just back of the motor. The carrying basket is 5½ ft. long by 3 ft. wide and 3 ft. deep, and is fitted with small wheels so that it can be moved easily in the parcels office or along the platform. The carrying capacity is 1,100 lb.

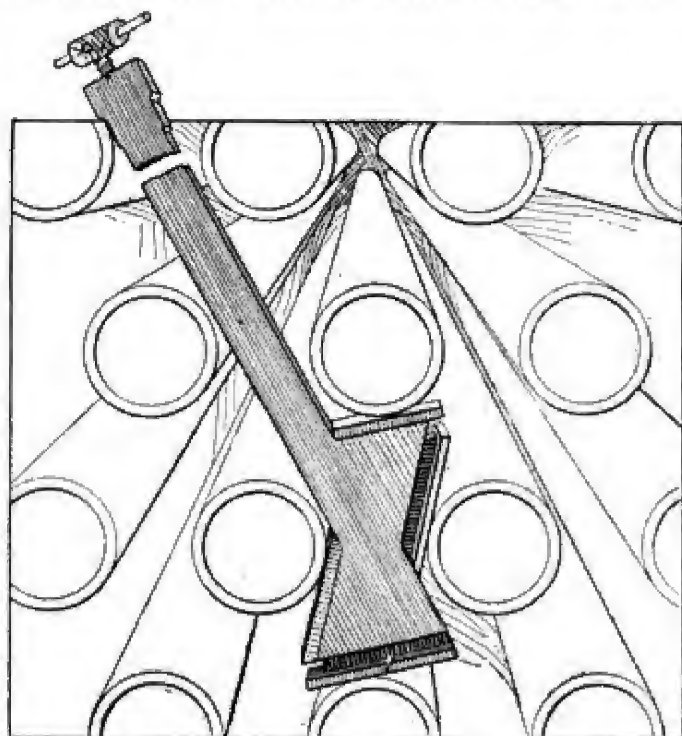
A LOOP NUT

Various devices are used for locking nuts to keep them in place, and, while many of them are of value, there are few good ways to lock a small nut without a cumbersome attachment which requires considerable time to adjust it in place. The loop nut illustrated is applicable to any size bolt, yet it is especially adapted for use on batteries, typewriters and small machines. The nut is formed so that it will bind on the threads sufficiently to keep it in place wherever it is set.



A SPREADER FOR BOILER TUBES

A tool for spreading the tubes of certain types of boilers has been placed on the market by a New York tool concern. It is made with an adjustable



Showing the Operation of a New Boiler-Tube Spreading Tool

spreader head, the movable part being operated by a threaded stem which screws into a nut on the inside of the handle and is controlled by the rod on the end. The working ends of the spreader have large faces, which prevent possible injury to the tubes. Its most useful purpose is to spread the tubes when it becomes necessary to replace the fire brick forming the baffle walls.

DISINFECTION IN THE XVII AND XVIII CENTURIES

In a medical work, published in Dresden, in 1711, the author gives the following rules to avoid plague contagion:

"In order to protect ourselves against the plague, we must first of all lead a clean life morally. Never open the windows if they face east or west, or when the weather is not fair, when there is a fog or rainstorm, especially if plague-victims live opposite or nearby. If the windows are opened at all,

this should be done between 8 and 10 in the morning. Living and sleeping rooms should be liberally fumigated with sulphur, saltpeter, incense, juniper, oak leaves, mastic, myrrh, birch bark, storax, or tar. From time to time, it is also well to burn nails, hoofs and horns of animals. Vinegar poured on hot slabs of stone is also to be recommended. As all kinds of foul odors and vapors must be avoided, it is necessary to remove at once from the house all decaying animal or other matter, offal and waste, to be burned."

Another author of the same period gives specific directions how to treat articles of dress, bed clothes, linen, furniture, utensils and even books, all involving washing in hot and cold water, fumigating and thorough airing, which should be repeated from time to time. Strict supervision was recommended that no diseased person might take part in these operations, and taken as a whole, and considering that the strong disinfectants we now have, as well as sewerage and ventilation were then unknown, the rules do not differ much from those of our day.

When a plague-stricken person had died in a house or when the disease had left a village or city, heroic treatment was resorted to. The city of Monaco was thus purified in 1631 after it had been ravaged by the plague, and a contemporary writer describes the treatment as follows: "All the inhabitants left their houses. These were then fumigated by burning hay moistened with vinegar or cheap wine, the smoke being left in the house until evening when the windows were opened. The following day another fumigation with aromatic plants such as leaves of rosemary or lavender, and on the third day a final fumigation with sulphur, to which mercury and arsenic had been added, is made. On the fourth day the house was perfumed by burning juniper, myrrh and the like."

But this was not considered enough to make the house again inhabitable, for the building was closed by the authorities and kept so for a certain length of time.

Of the house furnishings, books, etc., all that was considered of small value was burned—as for books, the physician was to judge which should be burned or not—and all the rest subjected to the most careful and minute cleaning processes.

In the meantime the survivors of the plague had also to undergo treatment in order to make sure that all disease germs would be destroyed. In solemn procession, chanting litanies, they marched to the sea, where all, men, women and children, undressed, were examined by physicians and then washed themselves first in hot water and then in the sea. While waiting, naked, on the shore, all their clothing was inclosed for one hour and a half in a nearby cave, where it was fumigated with a special strong perfume. After having dressed again, they marched as solemnly back to the churches and from there to their homes.

CRINOLINE AND AUTOMOBILES

If the style in feminine dress is to take the other extreme, and the circumference of the skirt becomes as large as it is now small, as European dress designers prophesy, the body design of automobiles may have to undergo change to fit the new require-

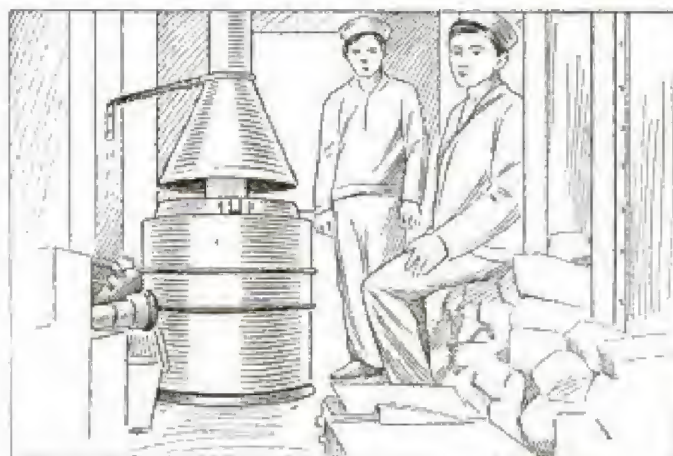


What May Happen in Automobile Construction if Crinoline Comes in Again

ments. This change, according to an artist of Motor, London, will take the form of doors so wide as to utilize almost the entire side of the car.

BRASS FOUNDRY ON BATTLESHIP

Included in the necessary equipment for making nearly all kinds of repairs, the U. S. S. "Georgia" has a brass foundry situated in a small deckhouse



The Brass Foundry on the U. S. S. "Georgia"

abaft the after smokestack on the upper deck. This deckhouse contains a combined blacksmith's forge and melting furnace capable of taking a No. 70 crucible, a bin having a capacity of 2,000 lb. of Albany sand, several flasks, iron and wood, and other foundry accessories such as tongs, shanks, clamps, etc. Since its installation about a year ago it has turned out 800 castings, the largest of which weighed 175 lb.

RAW FOOD SAID TO MAKE WHITE CORPUSCLES

Two French physiologists have recently demonstrated that a raw-food diet develops, under certain conditions, a considerable increase of the white blood corpuscles which play such an important part in the fight against invading bacteria. Cooked food, even in double doses, has no similar effect, according to these scientists. They accredit the value of the raw-food diet to the juices extracted from it in the process of digestion.

A school superintendent of Lake Forest, Ill., recently made a trolley journey from that town to Boston, Mass., in 78 hours, the distance being 1,542 miles. The fares totaled \$24.59.

TWO-PURPOSE TUNGSTEN FIXTURE

A tungsten fixture recently placed on the market permits the operating of an electric fan, toaster, or chafing dish from a socket being used at the same time for lighting. A specially designed plug taps into the socket of the tungsten as shown in the illustration.



Up to date the United States has expended \$59,580,000 on 28 reclamation projects, during which time 5,967 miles of canals, 19 miles of tunnels, 2,193 bridges and 24,235 buildings, of various kinds, have been built; 73,666,000 cu. yd. of earth and rock have been excavated; three of the highest dams in the world have been built; 1,245,682 barrels of cement have been used and as a result water is now available for 1,086,000 acres of land valued at \$105,800,000, which produced crops valued at \$20,000,000 in 1910 and supported 14,000 families. In addition to this, it is estimated that the population of cities, towns and villages contiguous to the government work has increased by at least 25,000.

LONG FLATCAR HAS CABLE TRUSSES

In addition to its exceptional length, which is 83 ft. over buffers, this flatcar, built for the North Belgium Railway, embodies several features of construction entirely different from those

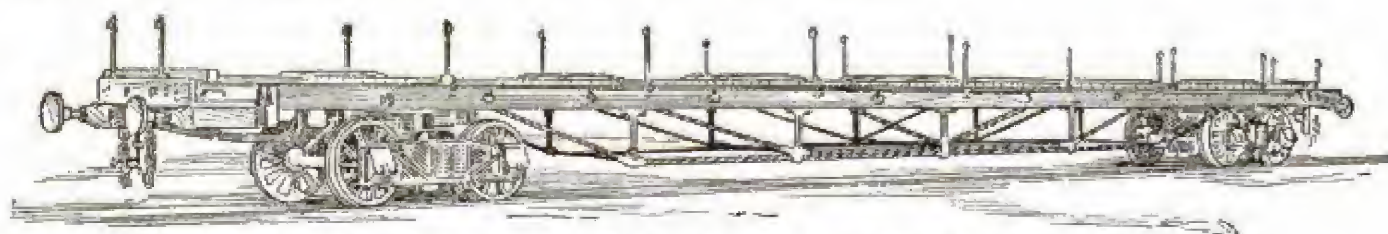
adopted in American railroad practice. The longitudinal sills or girders are extremely light, and, if the usual construction were followed, would be inadequate, but these girders constitute the compression members of the truss only, the tension members consisting wholly of the steel-wire cables, which constitute the most novel feature of the construction.

EARTH'S MAGNETISM SWINGS TRANSMISSION LINES

It seems that the breakage of electric power-transmission lines is often due to a peculiar swinging motion which such lines spontaneously assume when traversed by the current. What causes this swinging is not definitely known, but it is believed to be an electromagnetic phenomenon due to the magnetism of the earth. In experiments made in France it was found that a wire 60 ft. long began swinging with an amplitude of 24 in. when carrying a current of 20,000 volts.

According to a French scientific magazine, the geographical direction of the transmission lines has much to do with the seriousness and frequency of disturbances due to atmospheric causes, the lines running north and south being most frequently subjected to trouble. Also, that in hilly country, lines suspended so as to form a vertical zigzag line are much affected.

According to a census of the Union of South Africa, which has just been completed, the white people number 1,278,025 and the natives 4,061,082 out of a total of 5,958,499, the remainder of the inhabitants being blacks who are not natives of the countries included in the Union.



An Exceptionally Long Belgian Flatcar, Having Steel-Wire Cables as Truss Rods

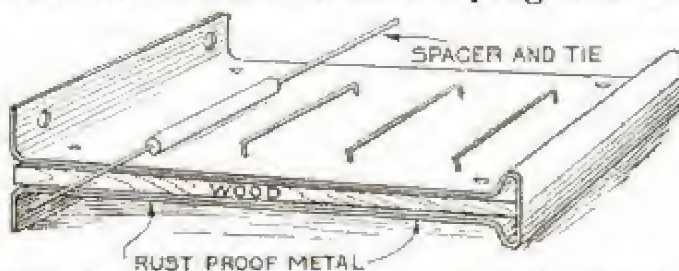
THE FUSION OF CARBON

The Italian scientist, La Rosa, who some time ago found that sugar carbon, formed on one of the electrodes of an arc produced by high-frequency alternating currents, showed a drop-like formation which indicated a partly fused state, has recently succeeded in obtaining the same result with an ordinary current. The maximum of this current was 80 amperes at 150 volts. He suspended a slender carbon filament between two carbon electrodes, and by gradually increasing the intensity of the current, so as to prevent sudden breaking of the carbon thread, it lengthened and sagged under its own weight just as a flexible wire. After the current was shut off, the whole surface of the filament showed little round congealed drops, but no trace of crystallization, proving that fusion had taken place.

According to "Cosmos," it seems probable, therefore, that science will soon find a means of completely melting carbon, and that the intermediate state between ordinary carbon and the diamond will thus be found.

NEW WALL PLUG AND SPACER

A new wall plug and spacer having a core of wood has recently made its appearance on the market. The wooden core greatly facilitates the driving of nails and screws into finished walls of concrete, brick, stone or tile, and holds them firmly in place. The wire attached to the plug acts as



This Wall Plug and Spacer has a Wooden Core to Hold Nails and Screws

both a spacer and tie-wire. When used in reinforced-concrete construction, the plugs are simply nailed to the forms before pouring the concrete.

AN INGENIOUS ROOFING NAIL

A new design of roofing nail has just appeared on the market. One of the greatest troubles encountered in

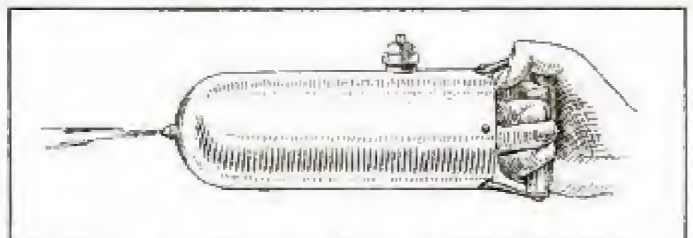


Manner of Using New Roofing Nail

the laying of prepared roofs has been the necessity for puncturing the roofing material in order to nail it. Rain water readily follows the course of the nail and the roof leaks. The nail shown does not pierce the layer exposed to the weather and at the same time does hold it rigidly in place.

GASOLINE GUN CLEANS AUTO MACHINERY

A gasoline gun, operated by compressed air pumped into it, and designed especially for cleaning grease,



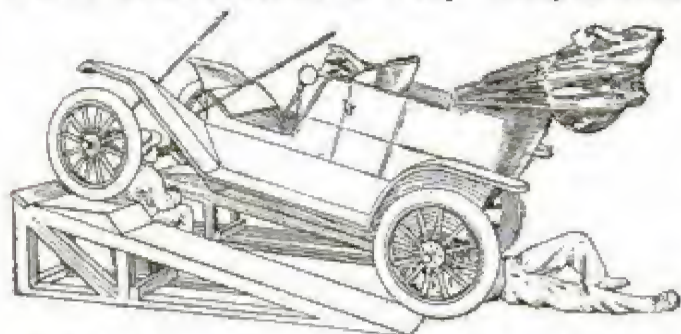
The Gasoline Wash-Gun in Use

grit, and other dirt from the machinery and parts of an automobile difficult to reach by ordinary methods of cleaning, is being placed on the market by a western concern. The gun holds a quart of gasoline, and, when pumped to a pressure of 100 lb., will instantly cut and wash the dirt away. It is used by holding down the nozzle so as to flush it with gasoline, and then pumping an air pressure of from 50 to 100 lb. into it. A small trigger arrangement controls the spray.

¶The Transvaal section of the Union of South Africa is reported to be the largest consumer of explosives in the world, approximately \$7,000,000 annually being spent for this purpose.

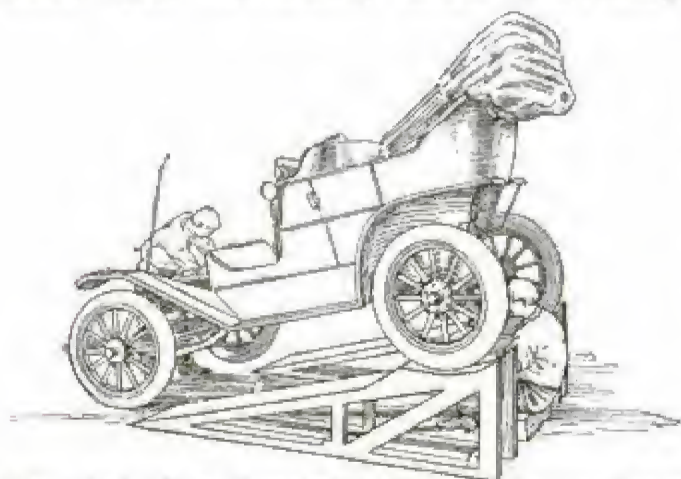
ELEVATING RUNNERS FOR AUTOMOBILE REPAIR

The foreman of the repair department of an automobile concern in New York has devised a very simple and



Elevating Device Provides Plenty of Space for Working under Car

practical device to aid in repair work under a car. It consists of a light elevating runway upon which the car is run. When the repair work is forward, the front end of the car is pushed up onto the elevation, thus providing



Rear End of Car Elevated to Provide Working Space under Rear Axle

plenty of room to work under the front axle. When the work is at the rear the car is reversed and pushed up the incline backward.

WEARING QUALITIES OF LINOLEUM

The wearing qualities of linoleum are said by the "Cosmos," a French scientific magazine, to be greater than either wooden or tile floors. According to this authority a perfect linoleum carpet has twice the resistance of a tile floor against wear, and more than four times that of a wooden floor. In actual use, however, this is far from the case, but this is said to be due to

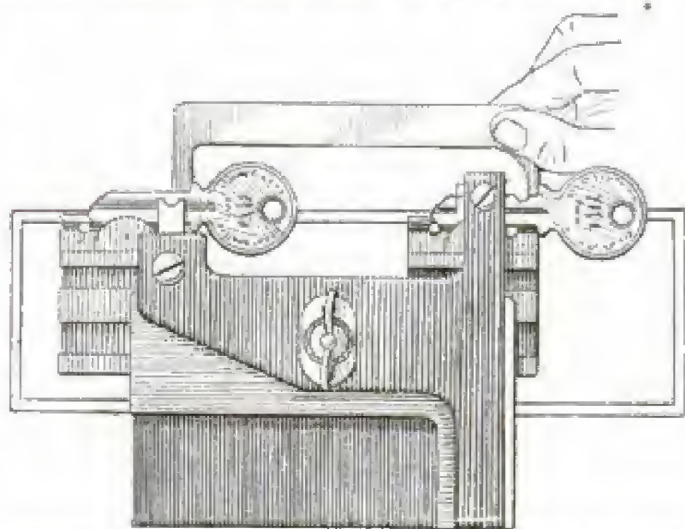
faulty and uneven laying of the linoleum, and also to the fact that the industrial product is always more or less defective.

ARTIFICIAL MARBLE FROM CINDERS

By a process which is being kept secret until the patents are allowed, a Berlin engineer is claimed to have succeeded in producing an artificial marble of extraordinary hardness from cinders combined with a binding material and coloring matter. With the aid of apparatus consisting simply of iron pots, a gas furnace and an old copying press, he is said to obtain, in a half hour's time, a slab resembling marble and as hard as iron.

A KEY-FILING JIG

Keys for a pin-tumbler lock must be made accurately and when a new key for an old lock is wanted, it is not advisable to file it over an old key as a pattern. The file is liable to remove some material from the pattern key and neither one will then turn the lock. The only safe way is to use a jig, and the one illustrated is especially made for this purpose. In using this jig the filer cannot cut into the pattern key.



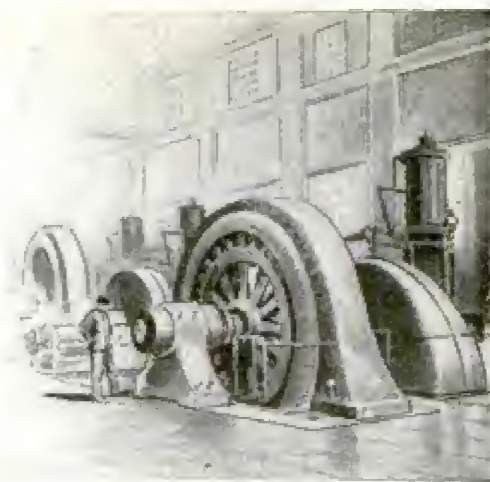
Device for Accurately Reproducing Keys for Pin-Tumbler Locks

The pattern key is clamped in on one side and the blank on the other and the pin guides the file.

An Answer to the Servant Question

The Second of Two Articles on the Cost of Electricity in the Home

By HENRY TARKINGTON



ELECTRICITY, the silent, mysterious handmaiden of modern scientific and mechanical progress is knocking at the door of every home. She is mute. She has no followers. She wants no "afternoon off." She lets you fix her wages. The children do not bother her. So long as there is a trolley line from which she can obtain necessary encouragement when her spirits are low, she works just as well in the country as in the city. She is never ill, never tired. She does not sleep. She always works at a maximum speed which you fix yourself. As she has upset all laws and customs of the industrial world, so she is prepared to silence forever that domestic cynic whose religion is summed up in the creed—"woman's work is never done," and to make possible an emphatic affirmative answer to the long-discussed question of whether or not "two can live as cheaply as one."

While it may be a national trait of the American people to take no short cuts to leisure and to scorn the man who would live without labor, this condition does not apply to the home. The work of scientists and mechanics in general industry for the past hundred years has been toward securing an increase of output in the same hours of labor.

The amount of work in the home has a fixed maximum. There are meals to prepare and serve; rooms to clean and air; dishes, clothes and linen to wash. There has been very little variation in the amount of work required to do this, except in proportion to the financial condition of the person doing the work.

As an abstract proposition, the labor required is about the same everywhere. And the trend of domestic science has been to lessen the labor of doing all this, to curtail the drudgery and to give the housewife more time for other things. For many years the woman who worked in domestic service has been a forlorn figure before a sympathetic public. The gratuitous sympathizers did not eat any less, get less mud on their boots, wear fewer clothes or keep them in better condition. Having expressed their sympathy they let it go at that. And the housekeeper was left just as forlorn.

But the day of her emancipation has come. Electricity has been put forward as the answer to the servant question. You have been informed that electricity will do all sorts of things for you if you will let it, but that the expense of apparatus and operation are prohibitive. And it does appear to be a fact at first glance. Go over the question and see just how cheaply it can be done. Understand first and foremost what you are paying for your current and then figure out what it would cost you to utilize more of it. Do you know that the more current you use the less you pay for it per unit? Few people do. And yet it is a fact.

It is probable that it now costs more than it will ever cost again. The more you use the current the less it will cost you per unit, and the more people using it the less it will cost them individually. There is a very good reason for this. It costs just as much, requires just as elaborate a plant, pro-

portionately, to furnish 10,000 homes with current for lighting, three hours an evening, as it would to furnish current for cooking, washing and ironing five times that number of hours out of the remainder of the same day. The difficulty is that the power plants must be prepared to put out a maximum amount of energy during one short period of the 24 hours. Their plant goes on just the same, perhaps with a slightly reduced output at the times the maximum is not needed.

At the present time it is not exaggeration to state that the work of the household can be done by electricity as cheaply in many cities and in thousands of small towns, as it can be done with gas, coal or woman power. In some cities the monthly bill will be found to average more.

This refers entirely to doing the work in the home. It has no reference to heating because until that happy time arrives when current reaches its lowest cost, or at least until it is considerably lower than it averages throughout the country today, there will be no economy in attempting to heat the home by electricity.

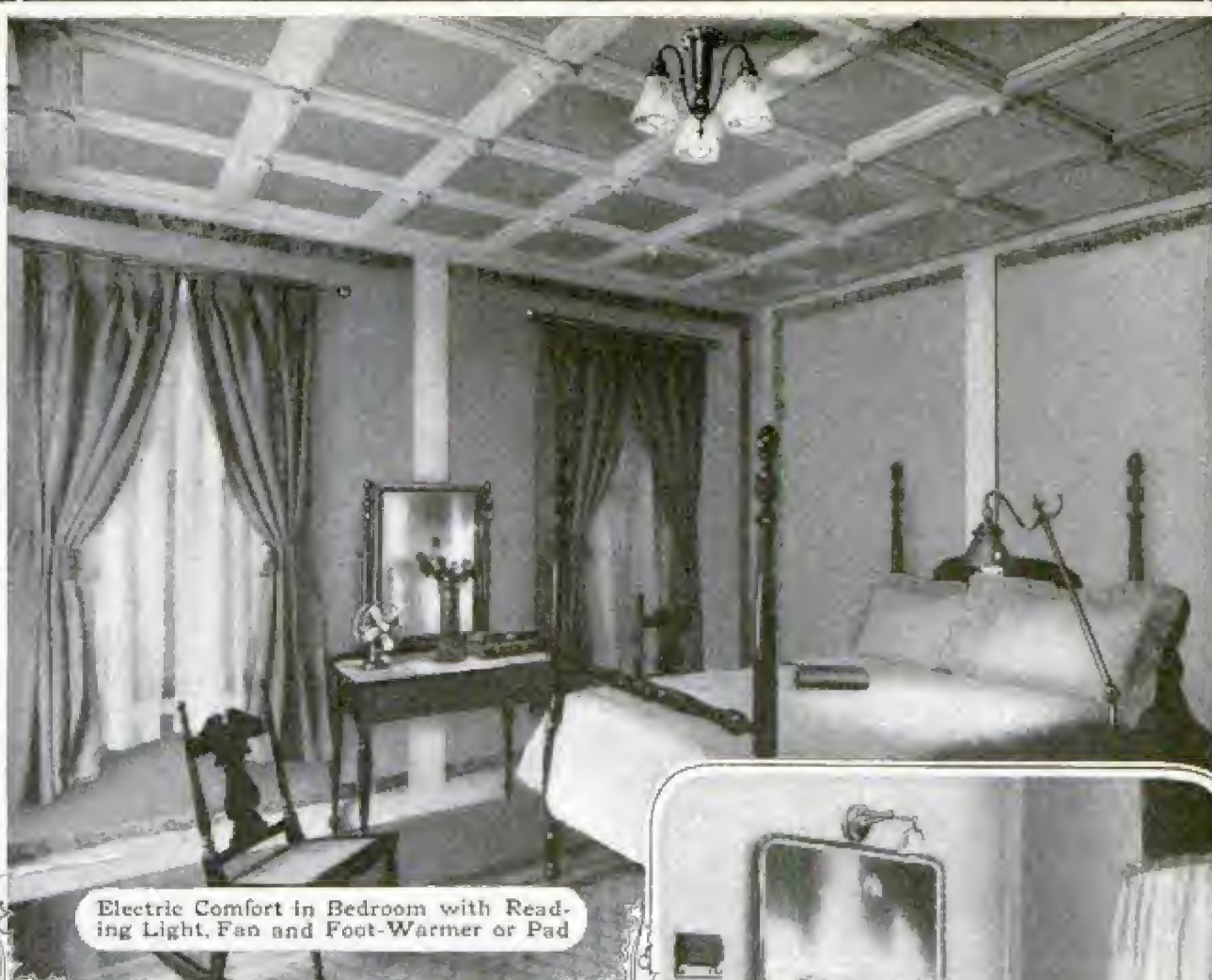
The question that naturally presents itself to the consumer of electric current is—"How much will it cost to do my cooking and how much will the apparatus cost?" No man or woman can tell absolutely how much current another man or woman will use in doing a certain thing. The rate for current varies a cent or two a kilowatt-hour in various sections of the country, but valuable information can be obtained from what current is actually consumed in certain domestic operations. And that is the purpose of this article. In the previous installment instruction was given as to how to calculate the cost of current. With this information the cost of operation of various household utensils can be readily deduced, the local rate for current being used as a basis for calculation.

The housewife unfamiliar with the use of electric current will probably lose the gist of these calculations if she

does not remember that the maximum heat is on tap at all times. She would naturally allow some time in her sum for the heating of the apparatus. This is an error. The writer has an electric iron provided with a stand so that it can be used as a stove. This iron is ready for use as an iron within one minute after the current is turned into it. It will retain its heat as long as an ordinary flatiron. When used as a stove, the amount of current consumed is calculated on the basis of the amount of time necessary to boil water. Every housekeeper knows just how long water will take to boil. That is all she will find necessary to calculate. In using a percolator it is not necessary to keep the current turned on after the coffee has been made. Many persons using such apparatus turn off the current the minute the coffee begins to percolate. The heat that is retained in the utensil is sufficient to continue the operation. And that is the economy of electric cooking. There is no fire to burn out. The minute its work is done the current is turned off and the expense stops the instant the switch is turned.

The electric iron is without a doubt the most popular electrical appliance for the home. It is without a peer for relieving the drudgery and distress of the middle-class housewife who does her own work, and to the hardworking laundress it is a veritable godsend. A good electric iron can be bought for \$4.50, and on the average consumes about 500 watts. Thus in one hour's continuous use it would take 500 watt-hours of electrical energy. In two hours it would use 1,000 watt-hours, or 1 kilowatt-hour, which in an average case would cost 10 cents for current. An electrical statistician estimates that the average cost per month of using an electric iron in a large city is \$0.60, which is a small price to pay for the relief from the heat of a coal or gas stove and the economy in time saved for changing the irons. Probably the gas would cost this much anyway.

The electric toaster is another con-



Electric Comfort in Bedroom with Reading Light, Fan and Foot-Warmer or Pad



In Bathroom are the Luminous Radiator and Water Heater for Shaving

The Real Center of Electric Domestic Economy, the Kitchen, with its Irons, Disk Stoves, Oven, etc.

COMFORTS IN EVERY ROOM IN THE ELECTRIC HOUSE

venience which is very popular. The average price is \$4.50, and the current consumed is about the same as with the electric iron, although the total time it is in use is less. The average cost for current to operate a toaster in a large city is not more than \$0.20 a month.

The coffee percolator averages \$13 in price and 500 watts in electric power to run it. Based on 15 minutes a day, and 10 cents a kilowatt-hour, such a device would cost for current \$0.37½ a month. The calculation is as follows: Fifteen minutes a day is 7½ hours a month. Multiply the number of hours a month by the number of watts ($7\frac{1}{2} \times 500$) to obtain the number of watt-hours a month. The answer is 3,750 watt-hours. Divide by 1,000 to get the number of kilowatt-hours. This is 3¾. And at 10 cents a kilowatt-hour the monthly charge for current is \$0.37½.

An electric chafing dish may be bought for about \$12.50. It uses 500 watts. Disk stoves vary greatly in price and current required, but most of them take in the neighborhood of 500 watts. A 2-lamp, luminous, electric radiator for the bathroom or bedroom will cost about \$8. It uses 500 watts. A 3-lamp radiator, costing \$13.50, takes 750 watts. A \$25 electric vibrator requires only 50 watts, and an electric sewing-machine motor costing \$25 uses so little current that its operating cost is inappreciable. The electric washer and the electric mangle, at \$85 and \$65 respectively (prices vary), take only about 125 watts each, and a \$125 electric vacuum cleaner with a 185-watt (¼-hp.) motor may be run 2 hours a week at a cost of only 15 cents a month for electricity, with current at \$0.10 a kilowatt-hour.

The small 8-in. electric fan is quite big enough for the average room. Its price is about \$9 and at 10 cents a kilowatt-hour it costs only about one-fourth of a cent an hour to run it on the high speed (24 watts), one-fifth of a cent an hour on the medium speed (18 watts), and one-seventh of a cent

an hour on the low speed (14 watts). At this rate one could run such a fan all night (7 or 8 hours) in the bedroom, on the low speed, for about one cent, surely a small price for a comfortable rest on a hot summer night!

Besides the devices already mentioned, there is the electric hair dryer which sells for about \$25 and consumes 350 watts, thus costing about 1 cent to operate for from 15 to 20 minutes; there is the 1/20-hp. (37.3-watt) general-utility motor, costing about \$21, and displacing the kitchenmaid in many of her chores at the rate of less than two-fifths of a cent an hour for electric power; and then of course there are the more pretentious electric kitchen cabinets and "automatic kitchens," the operating costs of which can be figured out if one knows the power of the motor in watts or in fractional parts of a horsepower, remembering that in order to convert horsepowers into watts it is necessary to multiply by 746.

So far the calculation of the cost for electric service has been very simple. For, at 10 cents a kilowatt-hour (1,000 watt-hours), the electricity costs 1 cent for 100 watt-hours, so that if one multiplies the wattage of a lamp or piece of apparatus by the number of hours it is in use, and divides the result by 100, the answer gives the number of cents the electricity will cost. But few electric companies charge a straight rate for current. Many people have puzzled over this. For instance, one month a person may have a bill for 50 kilowatt-hours, for 40 of which he is charged at the high rate of, say, 12 cents a kilowatt-hour (\$4.80), and the other 10 at the low rate of 7 cents a kilowatt-hour (\$0.70), making a total of \$5.50. (These are the rates in Chicago.) The next month he may use the same amount of current and be charged for only 30 kilowatt-hours at the high rate, reducing his bill to \$5. Of course he will wonder why this is, and perhaps put it down to the fact that the electric-light company has made a mistake, if the bill is reduced, or that it



Modern Bungalow Built in Boston, Every Room of Which is Equipped with Electric Appliances



View of the Garage Which Forms a Part of the Boston Electric Bungalow Equipment

HOUSE AND GARAGE IN WHICH ELECTRICITY DOES ALL THE WORK

is trying to reimburse itself at the consumers' expense for some political lobbying or for an increase in its taxable value, if the bill is increased. And he would be wrong. There is a reason, and a very just one, as will presently be shown, and by taking advantage of this reason to his own profit, the consumer can reduce his total bills very materially.

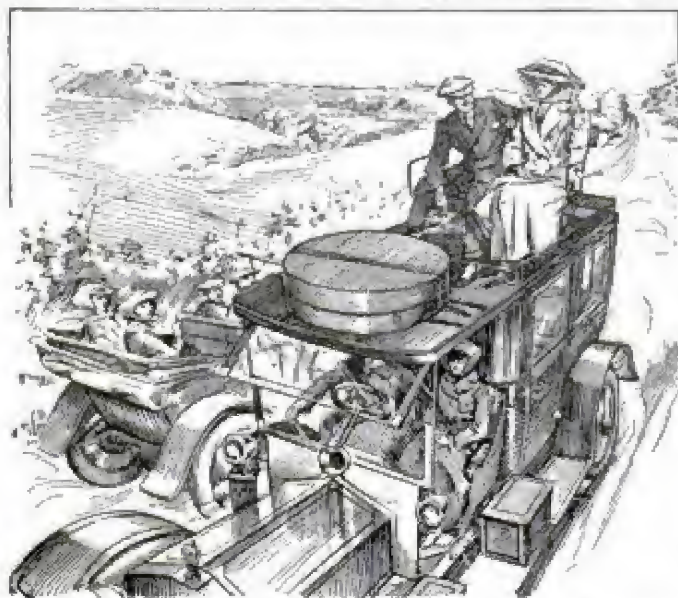
The high rate is due to what is called "the readiness to serve" of the company. It must be remembered that at the electric central station there must be enough electric generating equipment to be able to supply the maximum amount of current that will be used at any one particular time. Now suppose there are 20 lamps of 50 watts each in a house, and that these are all turned on at once. And at the same time suppose the servant is using a 500-watt electric iron. If the fuse does not blow with all this current being used at once, the house would require 1,500 watts, or $1\frac{1}{2}$ kilowatts, of power at once. Now it is obvious that if a large number of people made

a habit of putting such a big total load on the station, the electric generating capacity would have to be much greater than if the demand were distributed over a longer time. And naturally the charge for current would be greater. The electric company has a way of keeping track of the greatest demand for current by its consumers, for in all but the small apartments there is an instrument somewhat like a barometer and called a "maximum-demand indicator" which automatically registers the maximum demand made by a customer for current during the month. This is in addition to the regular meter which measures the current actually consumed. And the high rate applies to a certain number of hours' (usually 30) use of the customers' maximum demand during any one month. So that to cut down the bill it is necessary to use as little current at any one time as possible. Do not leave all the lights burning at once, and instead of using the percolator and toaster at the same time, make the coffee first and the toast afterward.

EXTRA SEAT ON AUTO TOP

Although the idea of using the top of the limousine as extra seating space has not yet been entertained seriously by automobile manufacturers in this country or abroad, such an arrangement exists on one car, at least, in

England. The owner of a car that is often seen near Canterbury placed a light double seat in the light luggage and spare-tire space on the limousine top, placing the spare tires forward of the luggage rack.



A Limousine with Seat on Roof for Viewing Country while Touring

ANCIENT TUNNELS OF JERUSALEM

The ancient tunnels, conduits and cisterns under Jerusalem offer interesting exploration for the archaeologists of the present time. About three years ago a party of British archaeologists began a systematic exploration, and so far have examined the famous tunnel leading from the Virgin's Well to the Pool of Siloam, running 1,700 ft. under the rock of Mount Sion. The tunnel was made by the Jewish King, Hezekiah.

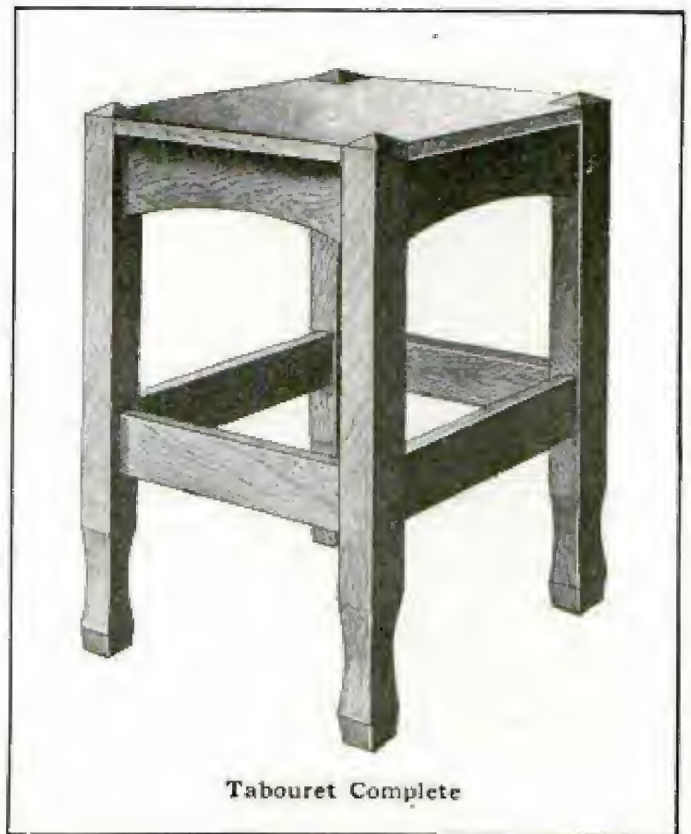
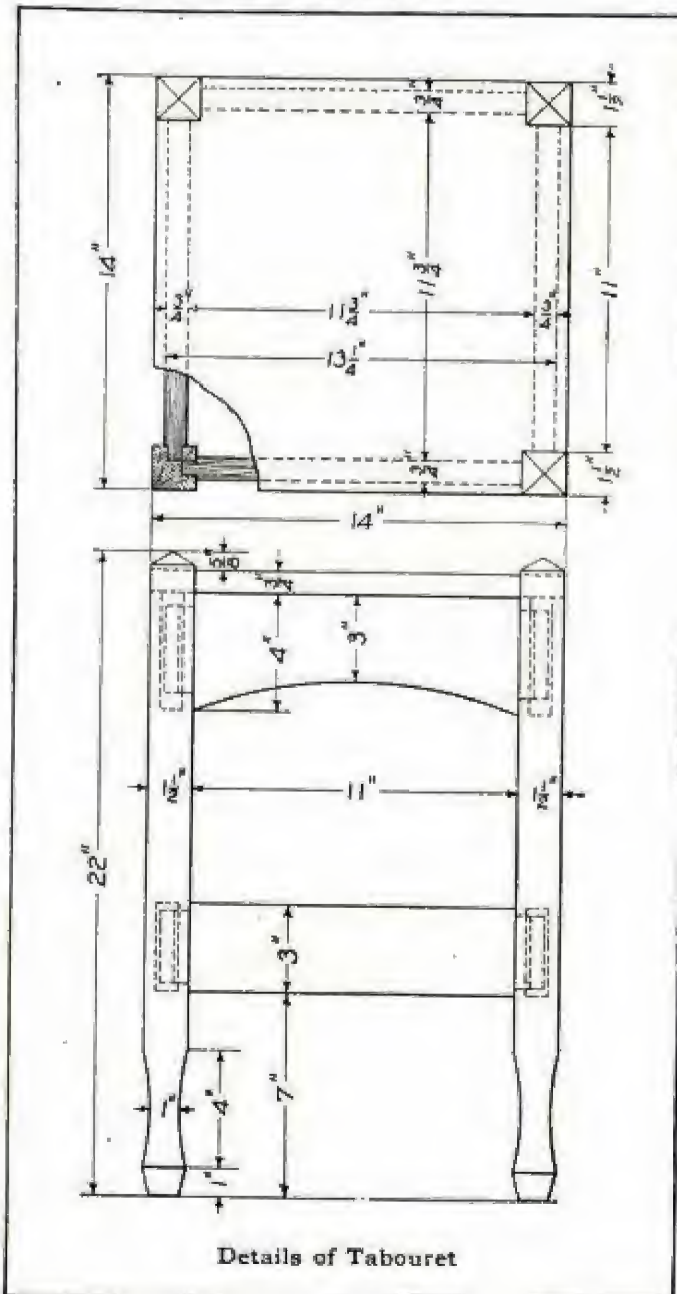
Among the things of interest found by these investigators was pottery

which dated earlier than the ninth century B. C. Included in this find was an Israelite lamp of the eleventh century B. C. Evidence gathered during the investigation seems to prove that Jerusalem was a Jebusite city 2,000 years before David.

HOW TO MAKE A TABOURET

The stock necessary to make a tabouret of craftsman design as shown in the accompanying illustration can be purchased from the mill ready cut to length, squared and sanded. Quarter-sawed oak is the best wood to use and it is also the easiest to secure. Order the following pieces:

- 4 legs, $1\frac{1}{2}$ in. square by 22 in. long.
- 1 top, $\frac{3}{4}$ in. thick by 14 in. square.
- 4 top rails, $\frac{3}{4}$ by 4 by 12 in.
- 4 lower rails, $\frac{3}{4}$ by 3 by 12 in.



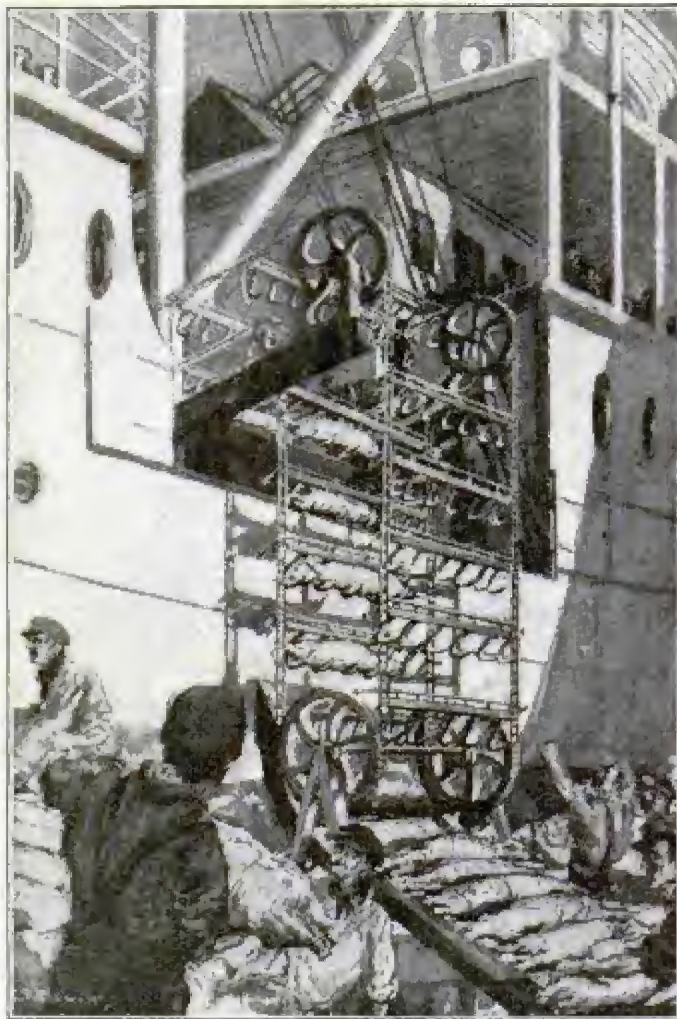
First square up the four legs. Bevel the tops at an angle of 30 deg. and hollow out the lower part of the legs as shown in the detail sketch. Clamp them together with the ends square and lay out the mortises all at once. Cut the tenons on the rails to fit these mortises. Lay them out in the same manner as the posts, so as to get them all the same distance between shoulders. The upper rails should be cut out underneath as shown.

The rails and posts can now be glued together. Be careful to get them joined perfectly square. When they are dry, cut and fit the top as shown. This is fastened to the top rails by means of screws from the inside. Remove all surplus glue from about the joints, as the finish will not take where there is any glue. Go over the whole with fine sandpaper and remove all rough spots, then apply the finish you like best.

AN English inventor has perfected a machine for treating old hardwood paving blocks so that the life of the block can be indefinitely extended at an extremely small cost, the machine having a capacity of more than 1,000 blocks per hour.

MEAT UNLOADER FOR PROVISION SHIPS

An endless-chain unloader, designed for the handling of frozen meat carcasses, is being used in unloading pro-



Unloading Frozen Sheep Carcasses by Means of an Endless-Chain Unloader at the Port of London

vision ships in English ports. Each crosspiece of the endless chain is provided with six hanging hooks on which the frozen carcasses are placed by the men working in the hold. Two or three men in the hold are all that are required to feed the unloader, and it automatically discharges its load into a barge or onto the wharf alongside the ship. It is said that a whole cargo can be discharged by means of this arrangement in about a third of the time usually taken by hand.

George A. Burns, the oldest track-walker, in point of service, on an eastern railroad, has walked 177,900 miles in the course of his duties.

POPULATION OF EUROPE IS DENSER THAN CHINA'S

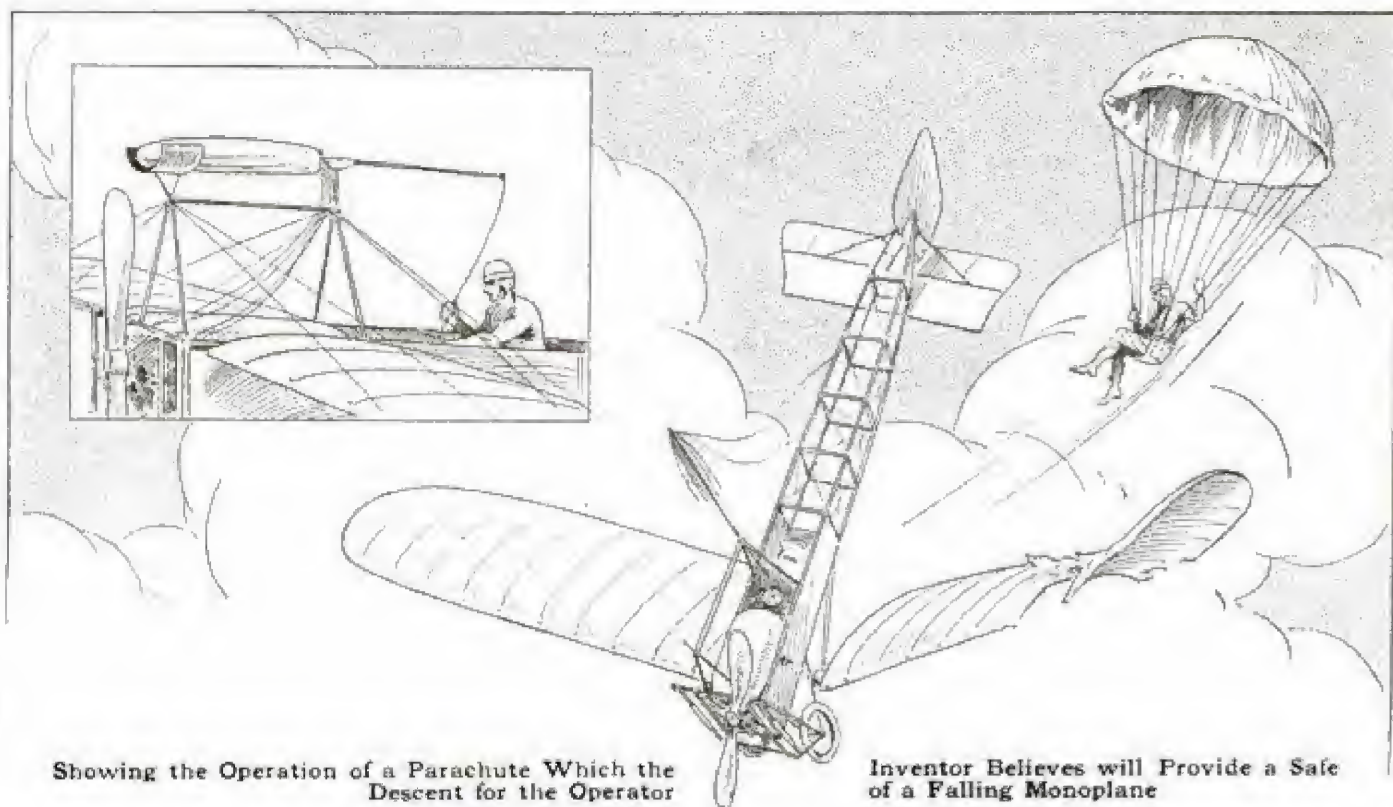
The enormous losses of life which usually attend floods and similar disasters in China help to maintain the popular idea that this country is the most densely populated in the world, and most people would probably take exception to the statement that Europe's population is slightly denser than that of China.

According to the latest census, the inhabitants of China number 439,214,000, while Europe has a population of about 430,000,000. As China is about one-tenth larger than Europe, the density of population of the two will therefore be found to slightly favor Europe.

PARACHUTE ATTACHMENT FOR MONOPLANES

An aeroplane parachute, designed for monoplanes or any type of aeroplane in which the operator rides above the planes, has been invented by two Italian engineers living in New York. The idea worked out by these inventors has several novel features, the most interesting of which is the arrangement by which the parachute is expected to provide a gentle descent for the airman and his seat while allowing the aeroplane to fall sheer.

In its inoperative or folded position, the parachute is horizontally disposed above the central line of the machine in the vicinity of the planes and just forward of the seat, in which position it resembles a skyrocket in appearance. When an emergency occurs which makes it advisable for the airman to leave his machine, he pulls a releasing cord, which causes the parachute to assume a vertical position, and, at the same time, releases the binding cords which hold a cover around it. So long as the cover is fastened around the parachute, the springs, which tend all the time to open it up, are held down like the wires in a folded umbrella. When the parachute is in its vertical



Showing the Operation of a Parachute Which the Descent for the Operator

Inventor Believes will Provide a Safe of a Falling Monoplane

position, and the cover loosened, the springs open it, and, upon the downward movement of the aeroplane, it fills and lifts itself free from the standard upon which it is mounted. All this occurs automatically after the operator pulls the cord. It is obvious that the parachute would have to be very large to act as a practical check for the entire machine in its fall, so this parachute is attached to the seat alone, which rests loosely on its bearings. When a fall occurs, therefore, the inventors of this novel idea expect that the parachute will gradually bear the airman and his seat to the ground, while permitting the rest of the machine to drop.

PERSPIRATION-PROOF SHOE LINING

By means of a new method of tanning, one of the large shoe-supply houses is producing perspiration-proof sheepskins for shoe linings. The new product is said to be no more expensive than other tannages of sheepskin, and is made in all colors. The deterioration of leather shoe linings because of perspiration is a frequent cause of complaint.

A SIMPLE FLOWER STEMMER

This little stemmer for florists is claimed to do away with 50 per cent of the labor usually required in constructing flower designs. It sets the leaves and flowers gracefully but firmly. The nature of the device and the manner of utilizing it are shown in the drawings.

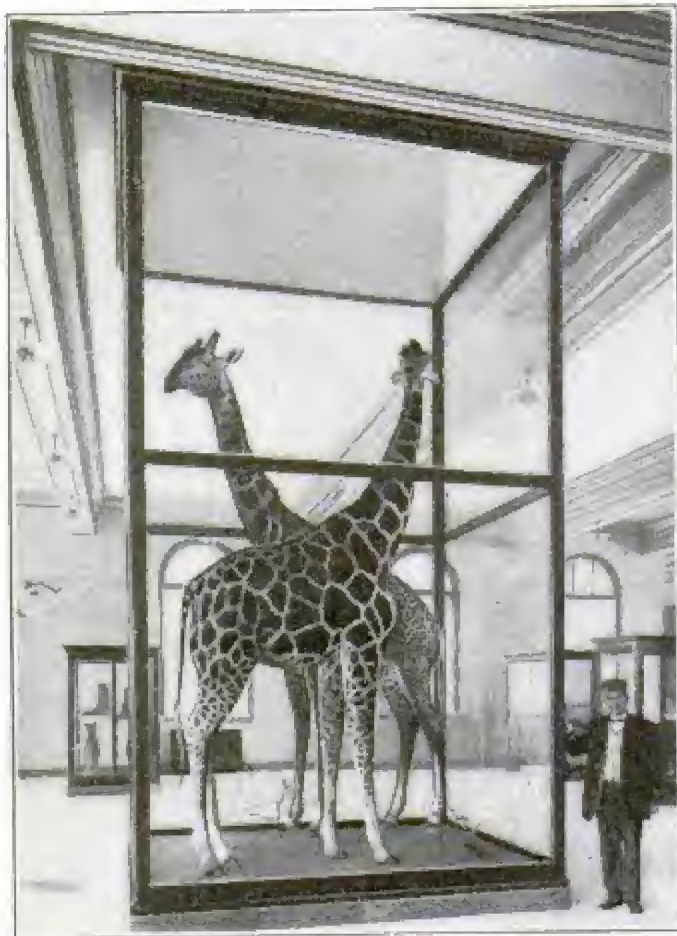


Simple Stemmer for Florists

AN old Indian emerald mine of the Andes in Columbia, lost for nearly a century, was recently discovered by a native, guided by a few hints contained in ancient Spanish parchment maps. For several years he wandered far and wide looking for this lost mine of Somondoco, which was operated centuries before the Spanish took it over in 1555.

MOUNTED GIRAFFES IN MONSTER SHOWCASE

The Childs-Frick exhibit of mounted animals, recently donated to the Pittsburgh Carnegie Institute, is now on ex-



Monster Showcase Erected in the Pittsburgh Carnegie Institute Museum for Protection of Mounted Giraffes

hibition there, protected by glass showcases. The showcase constructed to house the monster giraffes reaches from the floor to the ceiling, and consists of eight lights of plate glass. It is $18\frac{1}{2}$ ft. high.

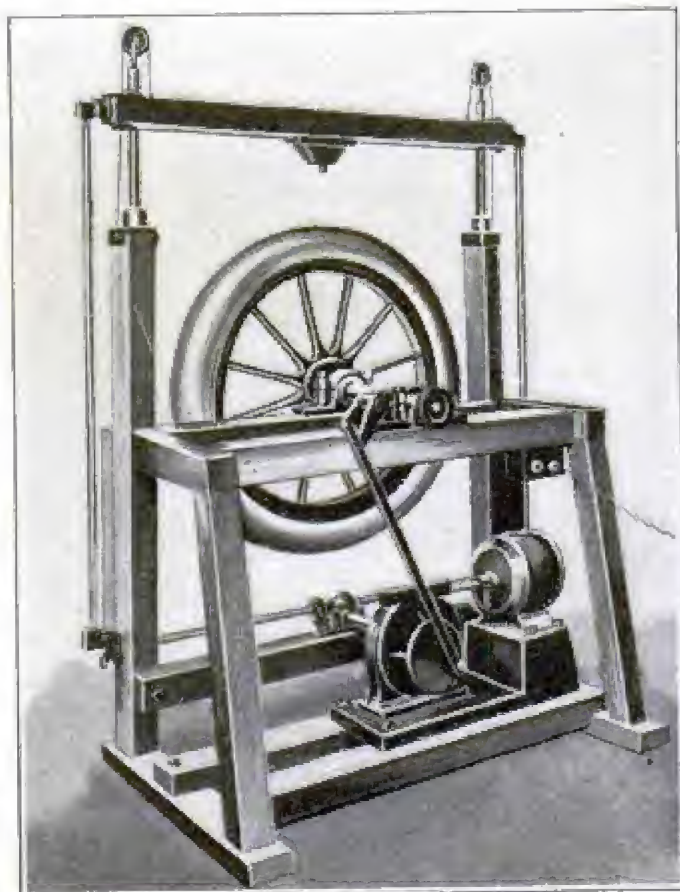
MAGNETISM CAUSES DRILL HOLES TO DEVIATE

It has been observed in British South Africa that the majority of drill holes of from 500 to 1,000 ft. in depth, produced by rotating drills, have a pronounced deviation from the perpendicular, and generally toward the north. This, according to the French scientific magazine "Cosmos," is due to the rotation of the magnetic field of the earth, the drill being strongly magnetized, with its south pole near the upper end and its north pole near the

lower. The intensity of the magnetism varies with the nature of the pierced strata. The attraction of the earth's magnetic field on the north pole of the drill rod manifests itself by a curving of the rod in such manner that its convex side is bent toward the south, thus causing the tool at the end of the rod to make a bore deviating toward the north. When this deviation has once begun it becomes more and more pronounced.

NON-PUNCTURE TIRE-TESTING MACHINE

The means adopted by a British manufacturer of non-puncture tires to prove the practicability of such tires is remarkable. As the wheel is revolved, the upper part of the framework of the testing device descends with great force, but the sharp instrument mounted on its under side fails, it is claimed, to puncture the tire. A 2-in. board mounted in the position occupied by the tire is easily penetrated at each descent.



Testing a Non-Puncture Tire by Plunging a Sharp Implement upon It



Evolution of the Bontoc Igorot

MAKING A GOOD CITIZEN OUT OF A SAVAGE

When Prof. Dean C. Worcester, Secretary of the Interior of the Philippine government, is asked about the progress of the American idea in the Philippines, being a man of few words he simply digs into his colossal collection of photographs and presents his visitor with three prints that answer the question conclusively and in a much clearer manner than an hour of descriptive conversation could do. The three pictures are portraits of the same man taken in "before and after taking" fashion. They present the features of a man of what is known as the Bontoc Igorot tribe, a people who inhabit the mountains of northern Luzon and whose principal occupation, before Prof. Worcester took them in hand, was head hunting and dog eating. The first photograph shows the man in his "native" costume—native in every sense of the word. A longer picture would show him wearing a "Gee-string" about his waist, this and the basket-like cap on the back of his head being the only species of clothing this particular man had ever worn in his life up to 1901. The second picture

shows the same man after he had been sufficiently impressed with the doctrines of civilization to cover his nakedness with a coat. He was then enlisted in the Philippine constabulary, a military-civil body of troops that occupies a place in the Philippines that would only have a duplicate in the United States if the county sheriffs and their deputies, the United States marshals and their deputies, the United States secret service, the state militia and the regular army were all combined in one organization. The third picture shows the denizen of Bontoc after he had been a year in the constabulary and shows as great a change in the intelligence of the man as in his costume. That's all!

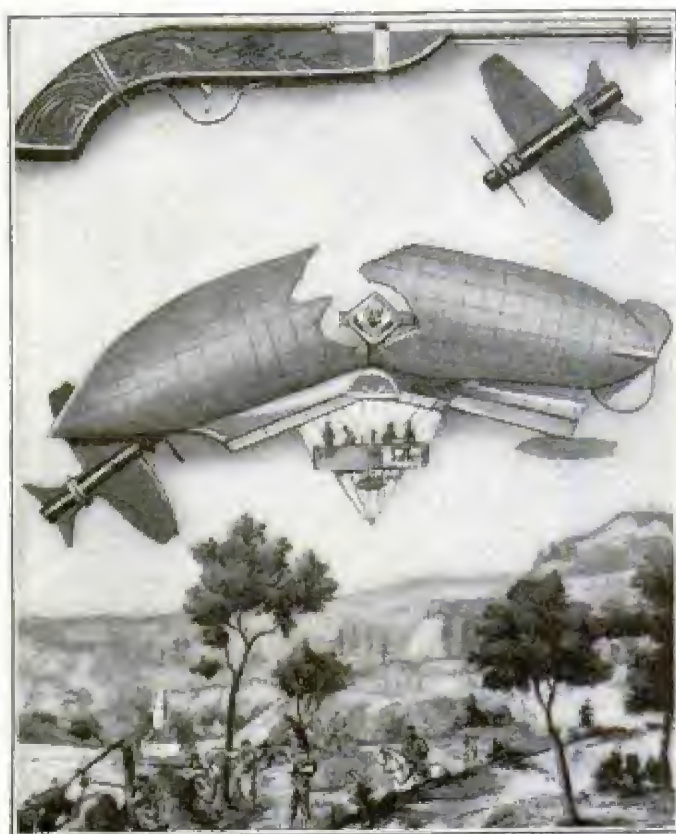
At least that is all that the picture shows. Again the observer loses something because only the upper part of the Igorot's body is shown. If this picture, too, were full length, a most amazing sort of soldier would be exhibited, for while the Igorot admits the decorative and dignified office of a coat, even if he will not grant its usefulness, he positively declines to be

hampered with such things as trousers except under great stress. Therefore he is permitted to wear his uniform without "pants," so that his strong, muscular legs will be in no wise impeded in the heart-breaking, nerve-racking and back-straining work of climbing his native mountains. One of the lessons the United States government learned in its dealings with

the Indians was that certain concessions to native customs and costumes were exceedingly beneficial, and this is one that is made in the Philippines. Thus we find the Igorot constabulary trouserless and the Moro section of the same body wearing fezzes, like Turks, but no shoes. They are Mohammedans and prefer going barefoot to wearing army brogans.

NEW TOYS EXHIBITED IN PARIS

Among the new toys recently displayed at a special toy exhibit in Paris were the three shown in the accom-



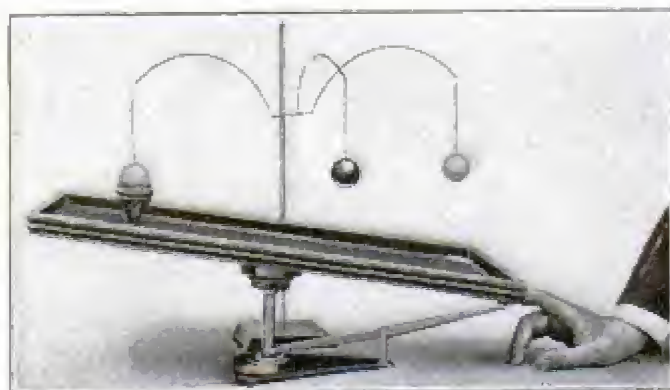
The Modern War Toy is a Game in Which an Aeroplane is Shot from a Pistol at a Dirigible Balloon

panying illustrations, two of which are related to aerial flight. One of them, called "Modern War," represents an attack on an airship, which carries a target consisting of two crossed flags. The projectile is a small aeroplane made of wood and celluloid, with a screw propeller attached at the stern. It is launched by means of a pistol, the barrel of which has a longitudinal slot for the reception of the wings, and when the target is

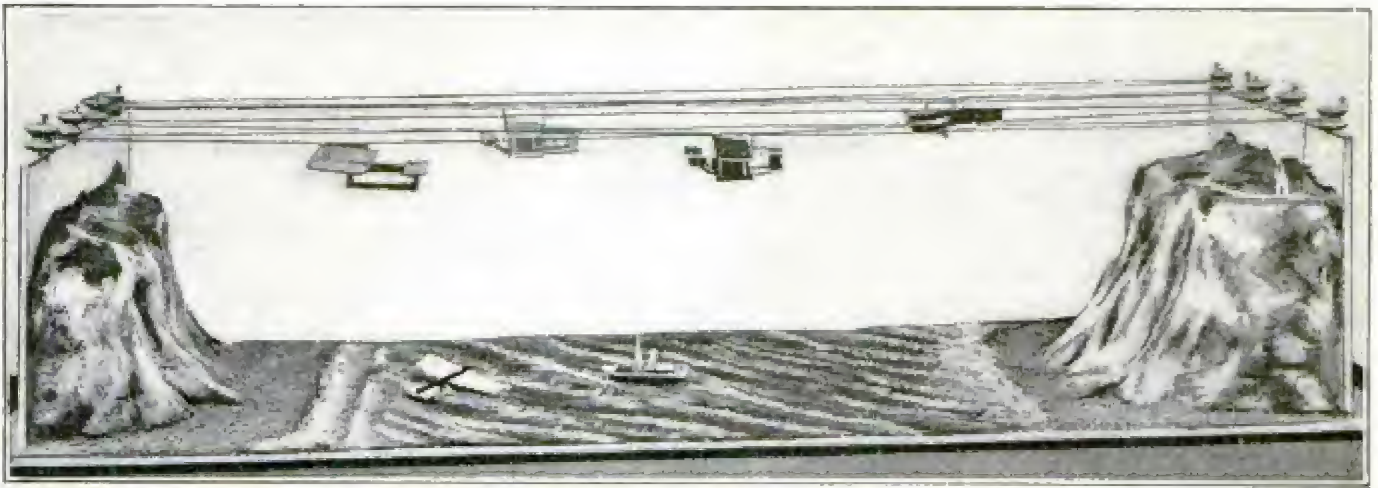
struck by it the dirigible balloon separates into two parts as shown in the illustration.

The other aerial game is called "a race across the channel." Starting from the French coast as Blériot did, the toy airmen endeavor to reach the cliffs of England. The aeroplanes are attached to elastic cords, which are stretched between pulleys on the two coasts. Each player, by turning his pulley, causes his aeroplane to advance, but also produces vibrations which frequently result in a fall into the sea, which for the sake of realism, is dotted with little vessels.

The third toy illustrated is a little billiard table mounted upon a spherical joint, which allows it to be turned and tipped in every direction. By the side of the table is a vertical support, on which slide three wires terminating in hooks, supporting three balls at a determined height above the table. The game is played by means of a top, the upper part of which is hollowed out to form a hemispherical cup



An Ingenious Game in Which the Hollow Top Receives One of the Balls and Spins Away with It



One of the Newest Aerial Toys is an Aeroplane Race across the English Channel

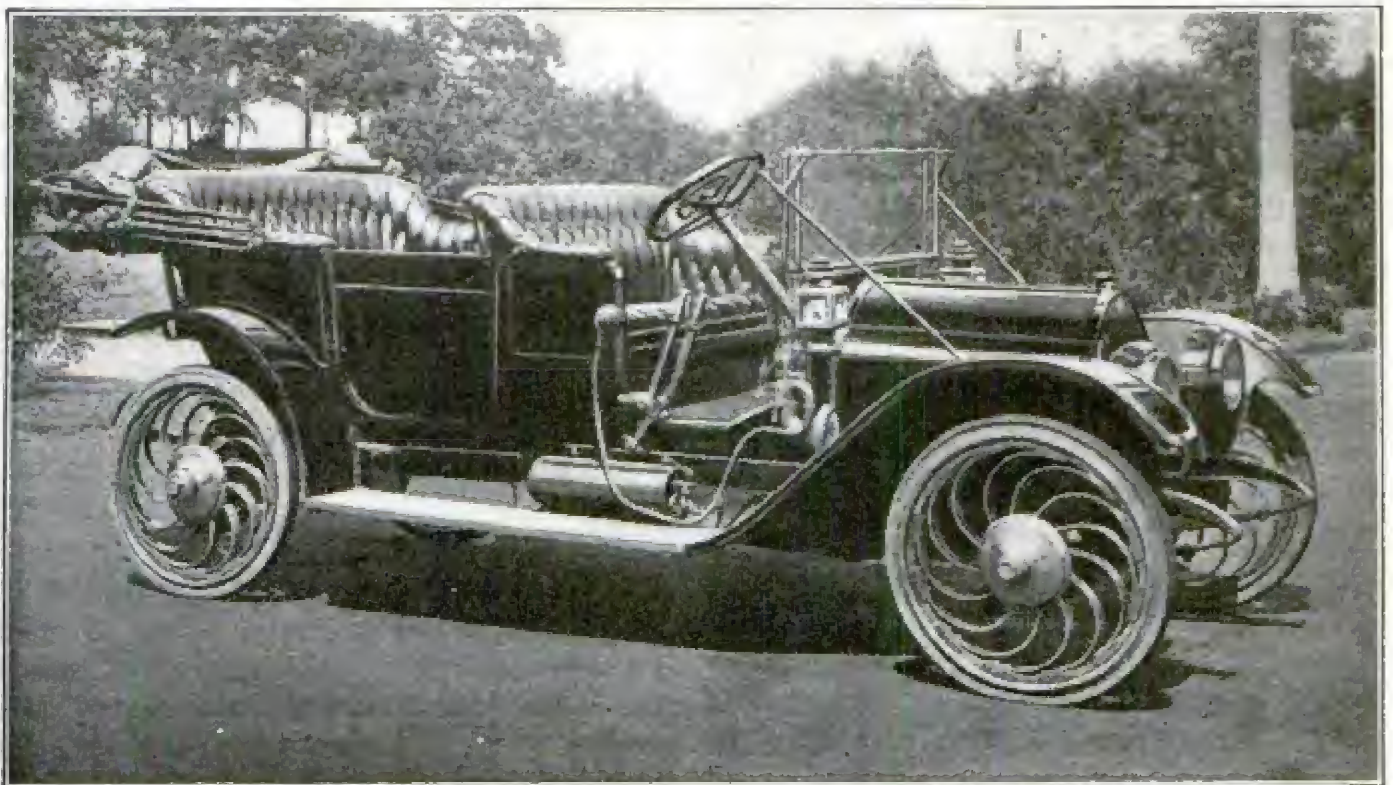
of a diameter equal to that of the balls. The player winds the top and sets it spinning on the table, which he then moves in such a manner as to bring the top directly under one of the three

suspended balls. He then tips the table so as to catch the ball in the cup, which raises the ball from its support and allows the top to go spinning away with its load.

SPRING WHEEL FOR AUTOMOBILES

Many spring wheels have been invented to take the place of a pneumatic tire, but the same resiliency secured by compressed air is hard to produce with springs. One of the recent patented spring wheels which has proven quite successful is shown in the accompanying illustration. The spokes of the

wheels are composed of flat springs formed into a helix, each one being bolted in the hub and adjusted for tension by a cam near the center of the helix. The outer ends of the springs have a shoe that fits neatly over the felloe of the wheel and slides as the pressure comes upon it.



Automobile Equipped with New Spring Wheels

Xmas and New Year Presents.

Cheap Sale

For a few days only

Album view and custom of north china.

Album photo and post card. Bronze land brushes wares.

Chinese wooden works ornamented and Figures.

Poisoned wares Vase, stamp case etc

Fancy metal (leam and cigarettles box etc. — Fan (silk and paper)

Kimono silk and cotton. Nikko carved works teable

Old postal stamps. Paper flag and flower chain

Renaissance teale cover and pillow Sharm

Satsuma (porcelains) Incenseurs and vase etc.

Silk handkerchief, shawl, cushion, table cover.

Screens silk and cotton with embroiders.

Ten service contains 42 p.e. and 21 p.e. etc.

T. Moriya

Japanese Store

62 Taku Road next of Tientsin Tobacco Co.

No. 272 - Parcel 14, Mt. III - (Sketch) now from Township 10 North - East 1/4 of 1/4

An interesting example of English as it is often written by Orientals is shown in this advertisement of a Japanese curio shop located in Tientsin, China.

"ARK" BUILT BY ILLINOIS RELIGIOUS FANATIC

In a barnyard a mile south of the quaint old village of Grand Detour, Ill., lies a curious "ark," built by a religious fanatic in expectation of a second flood. For many years it was kept ready for the deluge that did not come, and now that its builder lies in a nearby churchyard, it is slowly falling to pieces.



Queer Ark Built by Religious Fanatic of Grand Detour, Ill.

Local tradition is hazy as to the year it was constructed, but its Noah-like builder and his queer notion are remembered by the oldest inhabitants. The ark is about 20 ft. long, 8 ft. wide, and 4 ft. in depth, indicating by its limited size that its constructor intended saving only himself and family, leaving the luckless "animals two by two" to sink or swim. Unbarked trees from the nearby forest served as the framework for the craft, and onto this were nailed short, thin boards. Painted canvas was utilized to keep the upper part of the hull watertight, while below the estimated waterline are nailed battered squares of tin.

Because of this boat and its builder, a nearby hill, the highest land for miles around, is known locally as "Mount Ararat."

FRENCH BOTTLE COVERING PREVENTS BREAKAGE

A bottle covering that not only protects the fragile glass but is also a non-conductor of heat, has just been perfected by a French manufacturer. The character of the new covering is not known except that its principal ingredient is granulated cork formed in solid mass by a binding material. The covering is so successful in protecting the bottle from breakage that the French railroad authorities and postal officials accept bottles covered with it without requiring other wrapping or boxing. For such shipments the bottle is provided with a patent stopper which prevents leakage. The covering is molded around the bottle. Motorists and sportsmen have found the new covered bottles very useful.

Automobiles are being introduced in England for the transportation of mail between towns as a result of successful experiments recently completed, the motor vehicle being found more economical and, in some districts, more rapid than the railroads.



METAL WORK AND ETCHING

By JOHN D. ADAMS

Part III—Stationery Rack and Paper Knives

BESIDES being employed for the purpose indicated by its name, the stationery rack also serves to hold the unanswered letters and other papers that are to be attended to in a few days.

Our illustration shows three ways of constructing this article, and the line drawing gives all necessary dimensions, except the gauge of the metal, which should be No. 18. The left-hand rack is composed of three pieces—front, back and base—all securely riveted together.

This type is preferable where only a narrow rack is required, as the separate base provides the necessary stability. In bending the base, take due care to have it of uniform shape along its entire length, and then round off the corners. The front and back should now be squared up, allowing about a half inch for bending over to connect with the base. Do this bending over the sharp edge of a table while the sheet is

held down with a block of wood. The design for the front should now be taken into consideration and when decided upon is to be neatly drawn full

size upon paper. After thoroughly cleaning the surface of the metal, transfer the design thereto by means

of the carbon transfer paper, and then proceed with the painting out of the parts that are to remain unetched, using the asphaltum, thinned to the

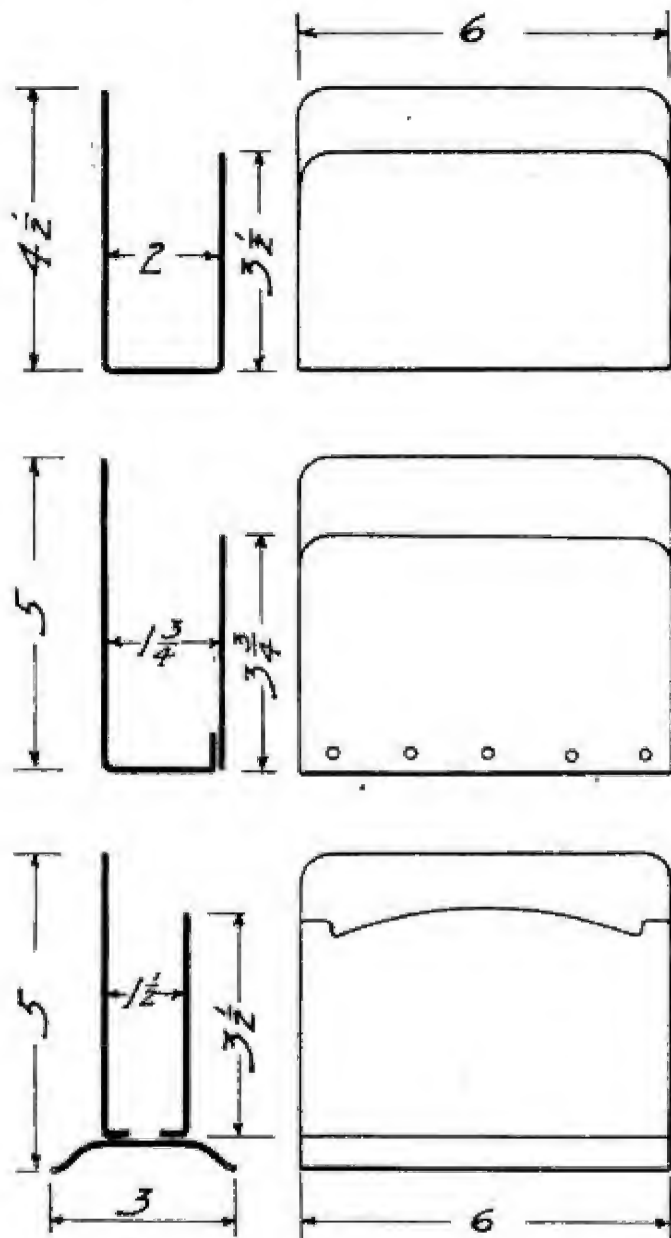
proper working consistency with turpentine. When dry, immerse in the etching solution (nitric acid one and water two parts) and during the progress of the work carefully avoid the inhalation of the fumes, which to some are peculiarly irritating. In the meantime rivet the back

and base together. After three or four hours, when the etching will have been completed, remove the paint with kerosene and thoroughly clean the metal. In either brass or copper a very fine verdigris effect may be obtained by an application of the following solution: Dissolve about 50 gr. each of copper nitrate, ammonia chloride and calcium chloride in 3 oz. water. The unetched portions may be rubbed up bright with a little pumice or very fine emery cloth, after which an application of lacquer will preserve the effect indefinitely. In trying a new solution, the



Three Styles and Designs of Stationery Rack

reader will, of course, appreciate the advisability of trying it on a small



Details of Stationery-Rack Construction

scrap before undertaking to finish such a piece as our rack.

The center design of the illustration is composed of but two pieces; viz., the back, which is bent under to form the bottom, and the front, which is riveted to the forward edge of the bottom. From what has already been said, the reader will have no difficulty in working out this rack. The making of the rivet holes in these racks will necessitate the use of a small hand drill, a tool that may be purchased for less than a dollar and one that will be found very useful in almost any kind of arts-and-crafts work.

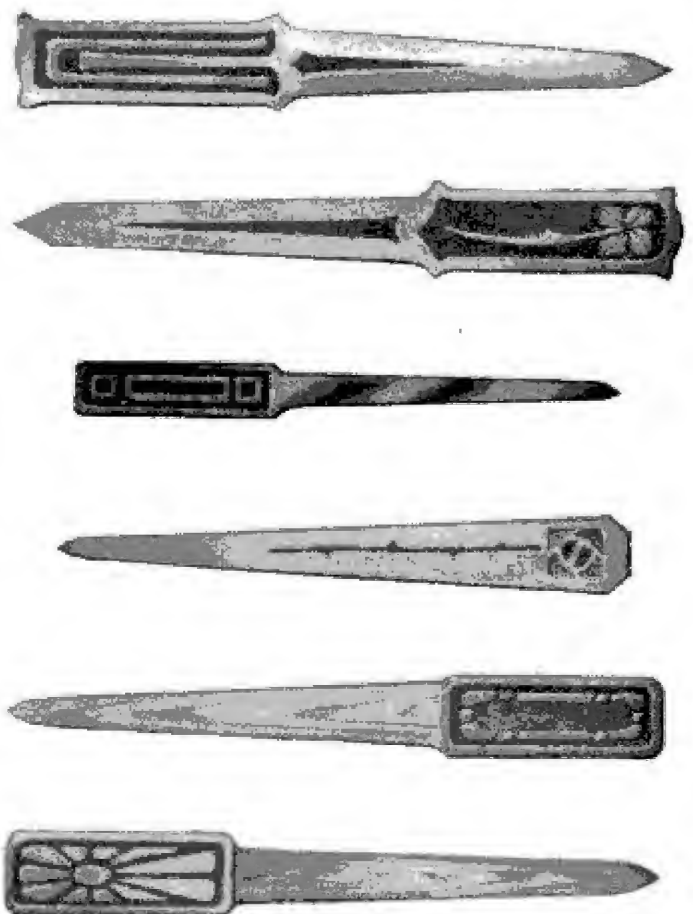
The right-hand design is made from

one piece of metal. In making the first bend, no difficulty will be encountered, but in the second one, some little care will be necessary in order to have the base perfectly flat. Other than this, the work will proceed as in the two previous racks.

Paper Knives and Letter Openers

Paper knives and letter openers may be made in lengths varying from 5 to 10 in. Where the opening of letters is the principal duty, a rather short implement will answer every purpose, but where the uncut leaves of books and magazines are to be dealt with, a longer knife is desirable.

The simplest type to make is illustrated in the fourth one from the top in the set of six, and consists of nothing more than a tapering strip of 16-gauge metal, on both sides of which an appropriate design is etched. The first two knives are made from quite heavy metal, which is filed thinner and



Designs for Paper Knives and Letter Openers

slightly rounding for the blade portion. This is not so tedious a process

as one might suppose, provided a good sharp file is used. The piece should then be smoothed up with a fine-tooth file and finished with emery cloth. The lower two knives are made from hard wood and have a small etched plate on each side of the handle. The wood should, if possible, be the same as that of the desk top on which it is to be used, and similarly finished. When this has been made ready, prepare the two small plates from No. 20 gauge brass or copper and thoroughly scour them, after which the design should be drawn out on paper and then transferred to the metal, which in the meantime must be kept clean from grease. With the asphaltum, paint out all those parts that are to remain unetched, including the backs; and, when thoroughly dry, immerse in the two-to-one nitric-acid solution. In the case of the all-metal knives, the paint need not be applied all over, unless the whole is to be dipped.

In coloring copper, many beautiful effects may be obtained, after a little experience, by simply heating over a gas flame. Iridescent effects, purples and chestnut browns will all show up one after another, and when the desired result has been secured, withdraw the metal from above the flame and set aside to cool. The high lights should then be rubbed up and the result made permanent by a coat of lacquer.

AUSTRALIAN BLACKS SHOW BURIAL CUNNING

The graves made by certain of the Australian blacks are so designed that the "Evil Spirit" coming to claim a victim may imagine it untenanted. The graves are dug wide and deep, and to one side is excavated a little unobtrusive shelf on which the corpse is seated in a huddled posture, hands clasped around the knees. A boomerang and a nulla-nulla are placed where he can easily reach them for defense, and a sheet of bark serves as a wall



Courtesy Illustrated London News

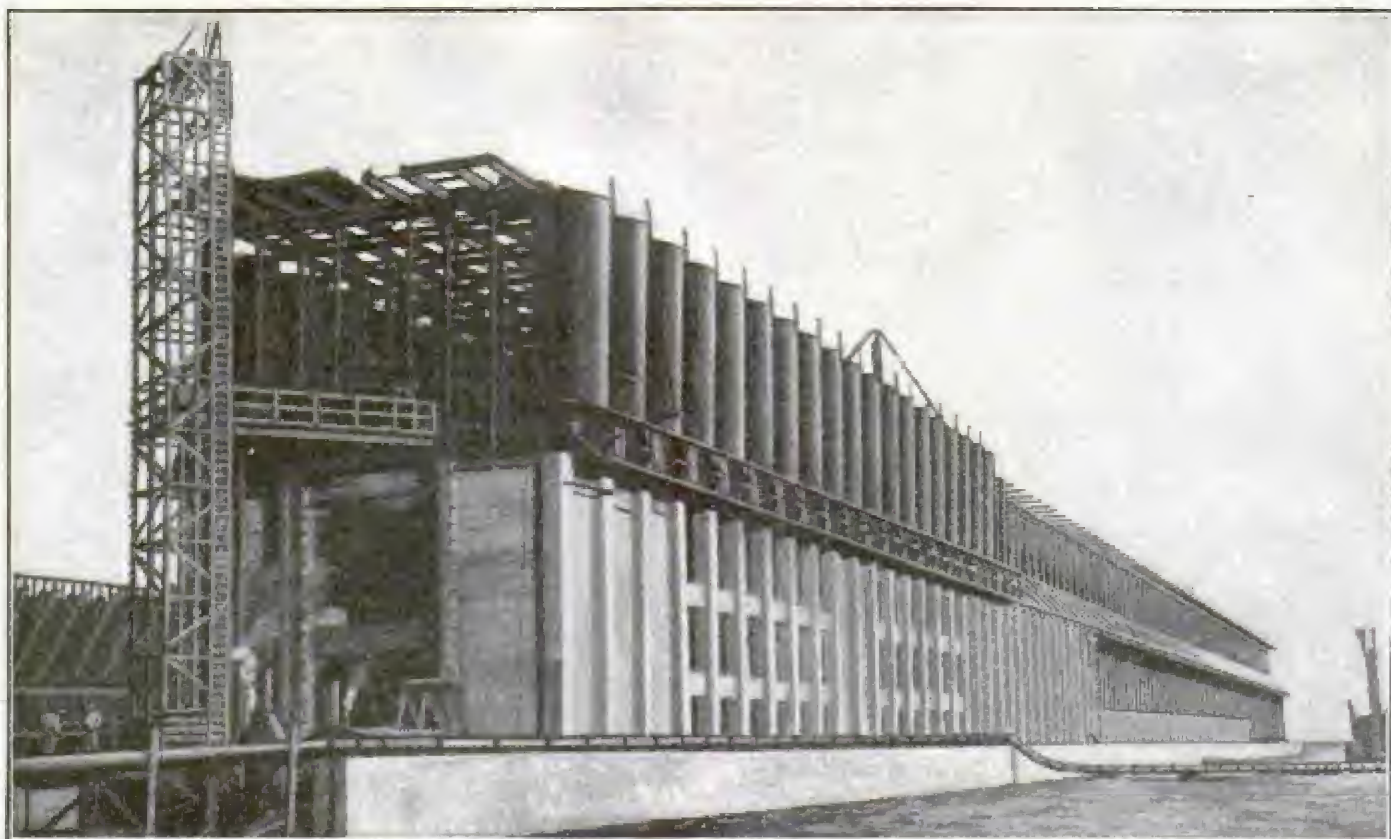
Fooling the Evil Spirit: Method of Burying Adopted by Some of the Black Tribes of Australia

between the shelf and the grave. After the grave is filled in, a mound composed of sticks, built up in sugar-loaf fashion, is raised above it as a guard against dingoes and the like.

SULPHUR FERTILIZER FOR POTATOES

Experiments conducted for some time at several agricultural stations in Germany seem to show that sulphur is a most excellent fertilizer for potatoes, not only being effective as a growth stimulator, but also as an exterminator of the parasites that attack the plants, and as a preventive of rotting in cases of excessive rain.

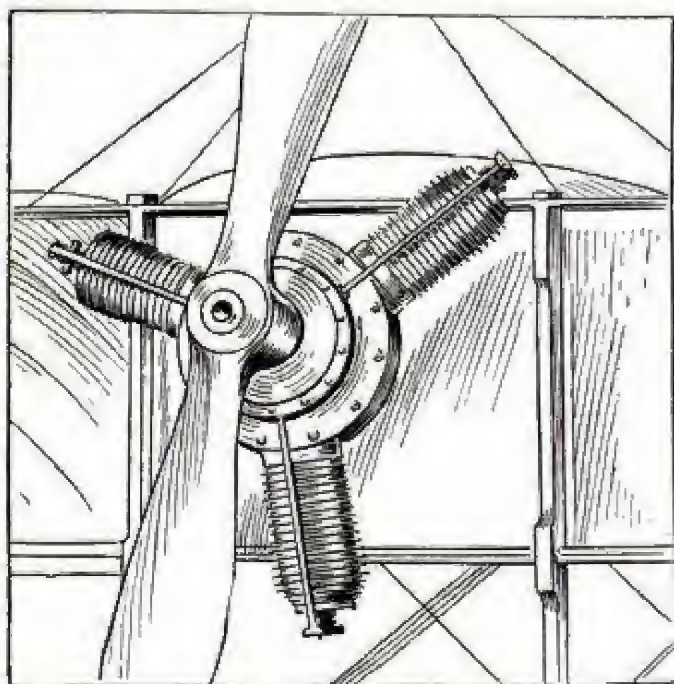
The application of refined, powdered sulphur is at the rate of 375 lb. or more per acre, and in no case has a section so treated failed to give a better and larger crop than fields not treated. Whether or not the increased crop depends most on the direct action of the sulphur or on its pest-extermimating action, the investigators are not willing to declare definitely at the present stage of the experiments.



Concrete-Steel Iron-Ore Dock Having 200 Sets of Electrically Operated Machinery and Chutes, and a Storage Capacity of 60,000 Tons

REVOLVING MOTOR WITH BUT THREE CYLINDERS

The latest type of Gnome aviation engine has but three cylinders and is designed for use in long flights, where motors of low power and fuel consumption are desirable. The new model develops 25-30 hp. and can be used with propellers ranging in size up to 8 ft.



Three-Cylinder Revolving Motor of Low Power and Fuel Consumption for Long Flights

CONCRETE-STEEL IRON-ORE DOCK

An iron-ore dock of unusual construction has been built at Marquette, Mich., for one of the northern Michigan ore railroads. Its length is 1,200 ft.; height, 75 ft.; width, 60 ft., and storage capacity, 60,000 tons. The lower work is of concrete with light reinforcement of structural steel, while the upper works and bin construction are entirely of steel. Four railroad tracks run on top, and there are 200 sets of machinery and chutes, operated by electricity.

It is claimed that this construction, while more expensive than the old form of wooden ore docks, costs considerably less than all-steel docks.

AN ELECTRIC FRUIT CAR

Much of the fruit grown in the great fruit belt of southern Michigan is transported to the Lake Michigan harbors for shipment to Chicago and Milwaukee in specially constructed electric fruit cars. The fruit car was originally a 52-ft. passenger car, but the rear half of the coach body was

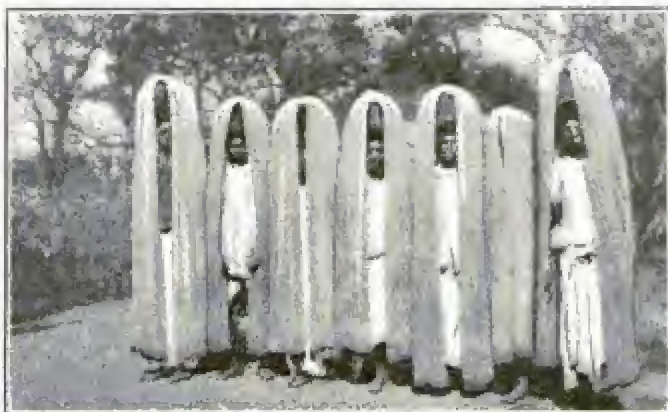
removed and a rack was substituted, extending to a height of 8 ft. from the floor of the car. Over this is stretched a canvas to keep the direct rays of the sun from the fruit, while the open nature of the whole provides plenty of air and helps to keep the fruit in a fresh condition during transportation.

CLOCK SIGN ANNOUNCES CHURCH SERVICES

An ingenious method of announcing the several different services has been adopted by the Second Avenue Baptist church, New York. On the front wall of the church is a large signboard, fringed with electric lights, on which is displayed the six foreign-speaking and the five English services or meetings. Each of the foreign-speaking services is indicated in English and its respective language. A clock at the left of the board tells the hour of the next service, and a flag displayed at the other end indicates whether it is English, Slovak, Chinese, Magyar, Italian, Polish or Greek.

FISHING NETS LOOK LIKE HEAD-DRESS

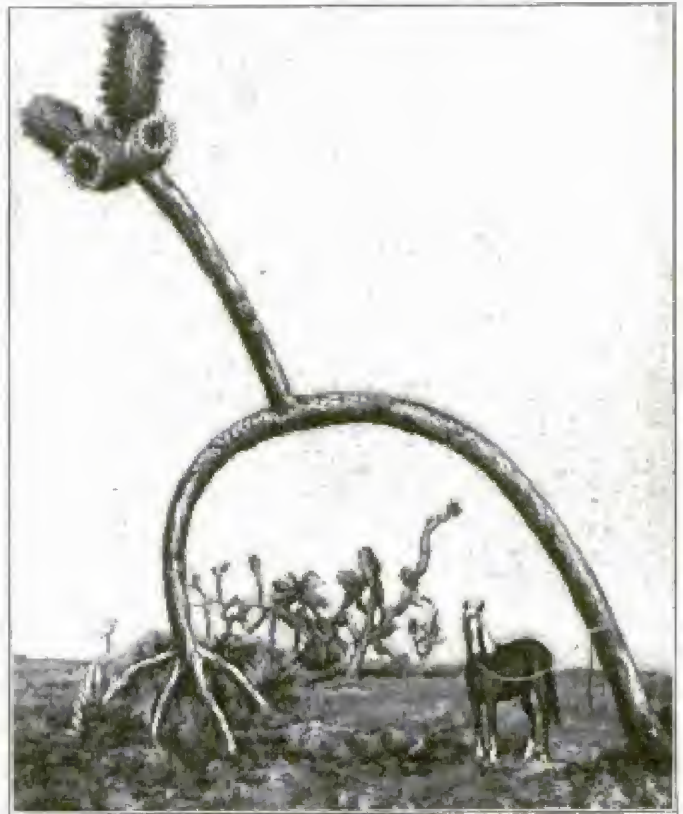
While returning home from the day's work the Malayan fishermen of Madura place the baskets of fish on their heads and then drape the fishing nets over them, in order to dry the latter in the sun. The result might easily be mistaken for a curious head-dress.



This is a Method of Drying Fishing Nets, Not a Type of Head-Dress

GIANT CACTUS RESEMBLES A SPUR

The great size to which the cactus plant grows in Arizona is clearly shown in the accompanying illustration, in



Giant Spur-Shaped Cactus as Compared in Size with a Horse

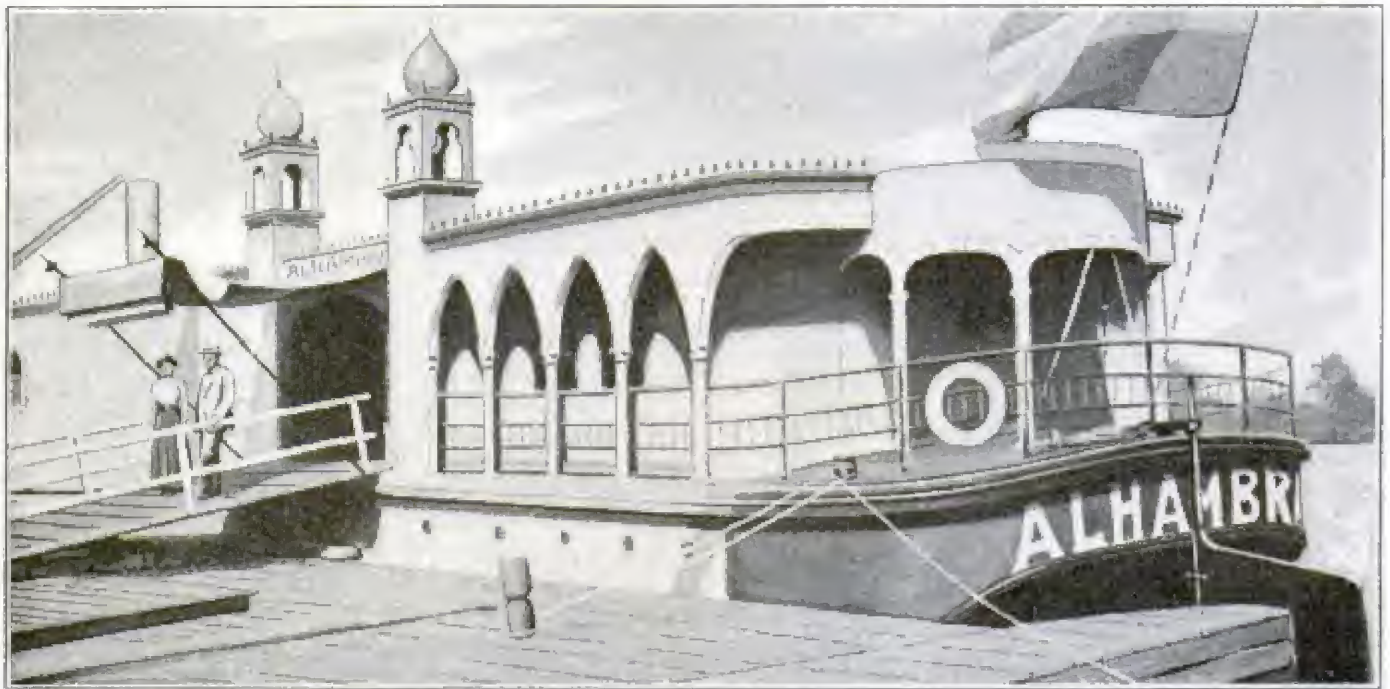
which a horse is included for the sake of comparison. Of still more interest is the fact that this plant takes the form of a spur, due, probably, to the strong winds, which bent the plant over until its top touched the earth, after which a second root formed and a new growth started upward from the top of the arch so formed.

FRENCH METALLIC FILTER

A metallic filter, claimed to be in many respects superior to the ordinary filters used in various industries, has recently been placed on the market in France. The filtering substance is simply a very slender nickel band with exceptionally small transversal ridges so that, when rolled around a central pin, there are minute interstices between the windings of the band. This roll is surrounded by a metal ring, in which it is firmly held by an appro-

priate mounting. A 6-in. filtering disk so made contains 5,250 ft. (not far from a mile) of metallic ribbon, 0.06 in. wide and 0.002 in. thick.

show or floating theater in Holland is devoted to the display of motion pictures. The theater proper is 160 ft. long and has a seating capacity to ac-



Exterior of Floating Motion-Picture Theater in Holland

This filter is said to be very effective, as foreign matter, even when glutinous and dried, never enters the small interstices, but gathers on the surface. The cleaning of the filter is accomplished by simply blowing a jet of steam or water through it in the opposite direction to that in which the liquid filters.

MOTION-PICTURE HOUSEBOAT IN HOLLAND

Traveling shows in Holland go by water instead of by train or caravan, and this mode of travel allows the means of transportation to be a theater as well. The latest type of traveling

commodate 430 spectators. The entrance is a gangway swung out over the canal bank when the barge is tied up for a performance.

ILLUMINATED CAP BADGES FOR HOTEL RUNNERS

An electric cap sign or badge, designed especially for the hotel runners or employes who meet incoming trains at night, has been placed on the market. The illuminated insignia, quickly attachable to the front of any cap, is aluminum, in the form of a box, within which is a $2\frac{1}{2}$ -cp. tungsten lamp, the illumination from which shines through the letters in the front of the box. The lamp is connected with an insulated electric cord, which passes around the cap, down under the coat collar and coat to a small dry battery carried in the hip pocket.



Interior of the Theater Proper

A permanent patent exhibit is to be established in London, England, which will be open the year round and is designed to benefit the inventors of the United Kingdom.

RADIUM MOTORS FOR CLOCK- WORK

The energy emitted by radium has actually been converted by a German scientist into power for operating clockwork. The minute, electrically charged particles which the radium throws off with enormous speed by a kind of atomic explosion can be intercepted and collected on a metallic leaf connected with an electrometer, or, itself, serve as such. The leaf, becoming charged, gradually deviates until it touches a contact, is discharged, and then drops back. This pendulum motion is repeated at regular intervals as long as any radium remains, and thus the apparatus becomes, in reality, a motor. of very feeble power it is true, but strong enough to mark the hours for a practically indefinite time. It has been stated that this is as close an approach to perpetual motion as will probably ever be found.

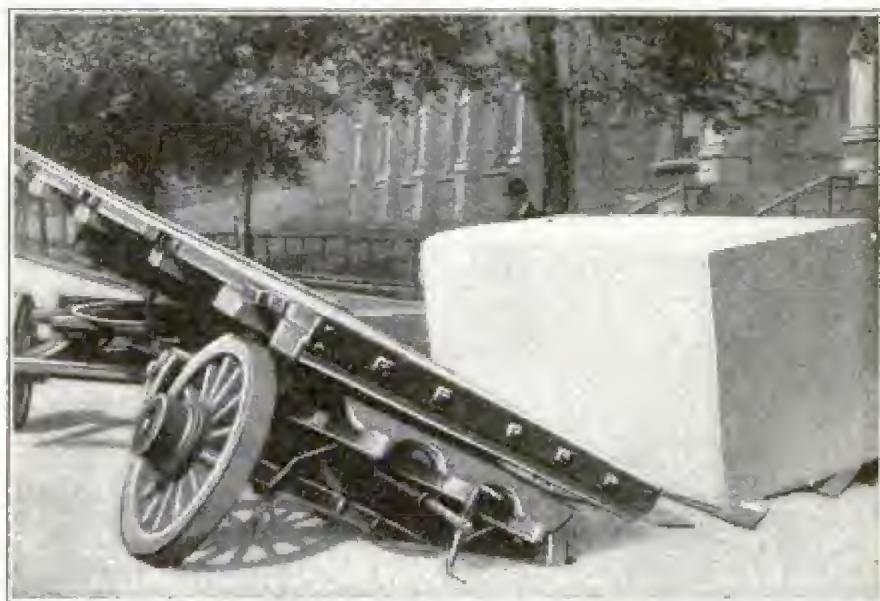
The radium motor must, of course, be kept in a vacuum in order to prevent disturbances and loss of energy, or, at least, be covered with an insulating material effectively preventing loss. One milligram (0.0154 grain) of radium salt suffices to run the motor, and the period of the running is indefinite.

CHINESE USE WOODEN TYPE

Although practically all books and papers treating of modern topics are now printed in China from metal type, books pertaining to old Chinese classics are still made with the old wooden characters. The peculiar odor of the ink used for printing from this class of type is inseparably associated with the classics to the Chinese mind and olfactory nerves.

STONE WAGON PUNCTURES ASPHALT PAVEMENT

Narrow wheels on a truck transporting a 15-ton stone block and a trench which had been poorly back-filled, resulted in the accident shown in this

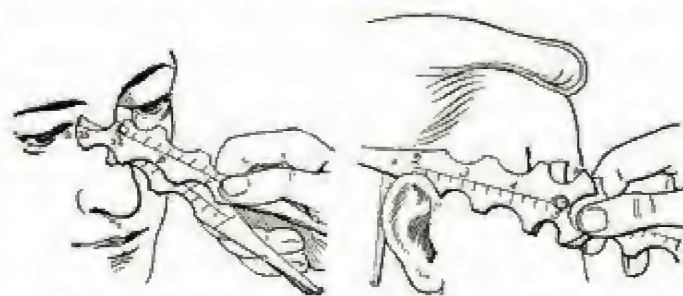


The Right Rear Wheel of This Heavily Laden Stone Truck
Cut through 10 In. of Pavement in Brooklyn

illustration. The stone was being drawn through a Brooklyn street when the rear right wheel of the truck crashed through 10 in. of asphalt and concrete pavement foundation, sliding the stone off into the street. The poor refilling of the trench had left the pavement crust unsupported.

FACE-MEASURING DEVICE FOR OPTICIANS

An ingenious measuring stick for opticians and two ways in which it is utilized are shown in the accom-



Taking Width and
Height of Nose

Obtaining Correct Length
of Temples

panying drawings. One illustrates the method of taking the width and height of the nose, while the other shows how

the correct length of the temples is obtained. The device is also used in taking the pupillary distance, the difference, if any, between each eye and the nose, the width of the nose at different angles, etc. It is made of German silver and is carried in the vest pocket like an ordinary rule.

BASKET-BOATS STILL USED IN WALES

These curious boats, resembling clothes-baskets in form, are modern types of the coracle, an ancient craft



How the Basket-Like Boats are Carried on the Back used by the Britons 2,000 years ago. They have survived the centuries and are still used in Wales by salmon fishermen. The modern coracle comprises a framework of sticks cut from the ash and beech trees, covered with a strong sheet of canvas, saturated with tar and pitch. They weigh about 25 lb. The fishermen using these boats work in pairs, the salmon net being strung between the two.

☞ There were 22,478 deaths caused by snakebite among the people of India last year and during the same period 2,400 people were killed there by wild beasts.

SUPERSTITIONS OF THE JAPANESE

The many superstitions of the Japanese, although gradually becoming less seriously taken as general education progresses, are still strongly believed by the older generation of the lower classes. Many of them, which have come down from the ancient religions and early Chinese influences, are similar to the disappearing superstitions of European races.

Chief among Japanese animal superstitions is the fear of the fox, which is believed to have supernatural power. Shrines called "Inari Jinsha," in which the fox is enshrined as a deity, are numberless. The name of the deity written in Chinese characters signifies fox, and from this it came to be generally accepted that the god was really a fox. Its natural cunning is greatly enlarged upon, and it is believed to be capable of misleading and deceiving human beings, which causes many to pray to placate the fox-god.

The badger is the next most dreaded animal in the superstitious mind. It is believed to have power to annoy people, its particular habit being a transformation into a Buddhist priest, in which disguise it is guilty of various deceptions and impositions. The crying of weasels and the baying of dogs are considered evil omens, and such insignificant happenings send a shudder over the believers. On the other hand, a light-colored mouse in the house is a sign of happiness, good omens are presaged by what are considered the pleasant cries of crows in the morning, while the so-called unpleasant notes forecast death and other dire disasters. If a spider falls from the ceiling in the morning, he brings pleasure, but if at night, it is thought reverses will follow. To see a centipede at night means happiness.

Potions also have a great place in Japanese superstitions. A potion made from a calcined lizard is said to cause a person to become enamored of the one administering the same. The power

and extent of this superstition may be judged by the fact that there are many firms in Tokyo dealing exclusively in calcined animal flesh. A solution of rice-beer in which a serpent has been immersed is thought to be excellent for consumptives. Monkey's liver is prescribed for all diseases of the eye. To have in one's possession a triangular-shaped plantain acts as a preventive of poison and shields from the designs of the fox, while many other plants are used for charms.

The number four, like 13 in our own country, is much in disfavor, owing to the fact that its name, "shi," signifies "death" in Chinese.

Many object to having their nails manicured at night, which arises from the custom of cutting the nails from the fingers of a dead person as keep-

sakes at such a time. Certain days are not considered propitious for beginning a new undertaking, but excellent for discarding anything, and the fittest for cleaning and scouring; rain on the fifth of May is thought to insure a rich harvest, wind on the third of March foretells that pear trees will be attacked by injurious insects, and fine weather on August 15 indicates a warm winter.

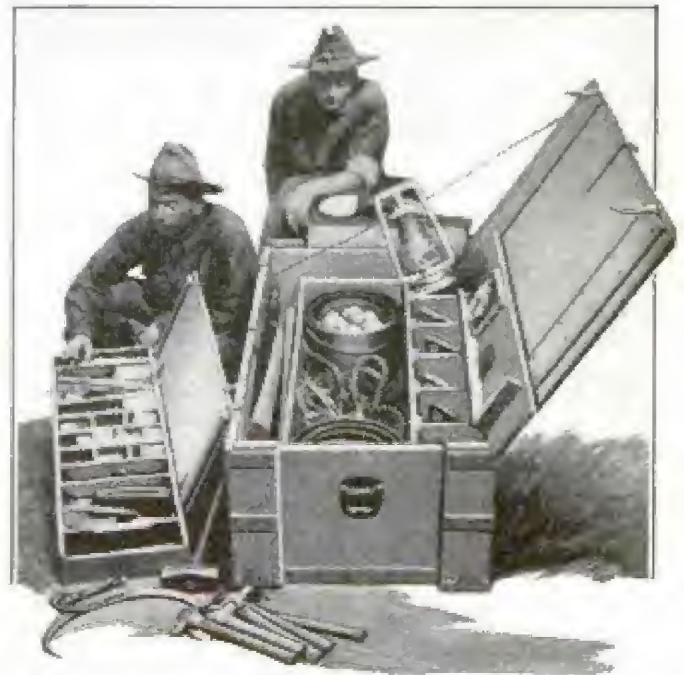
It is believed that if a person puts on a raincoat in the house, he may be destroyed by fire; tickling the sole of the foot means future poverty; if the hair of one's head be cast into the fire, he will become insane; a single cup of rice at breakfast means separation from parents; and a knife or cutting implement left on the hearth will be the cause of death at some future time.

SIMPLE SPEED INDICATOR FOR SHIPS

By inserting a vertical tube, having a short right-angled bend at the lower end (Pitot tube), below the keel of a ship with its mouth toward the stem of the vessel, a simple means for determining the speed of the vessel in relation to the water has been devised. The level to which the water rises in the vertical part of the tube depends upon the speed of the ship, and by means of a suitably arranged recording apparatus a continuous record of speed can be obtained.

TOOL CHEST DESIGNED FOR USE IN ARMY

A new type of tool chest is being given a try-out by the government with a view to its adoption for use in the regular army and national guard. The chest is designed to carry all the light tools used for emergency purposes by the troops. Heretofore such tools have been distributed through the regiments and many of them are lost. The chests are so constructed that two or three of them can be loaded

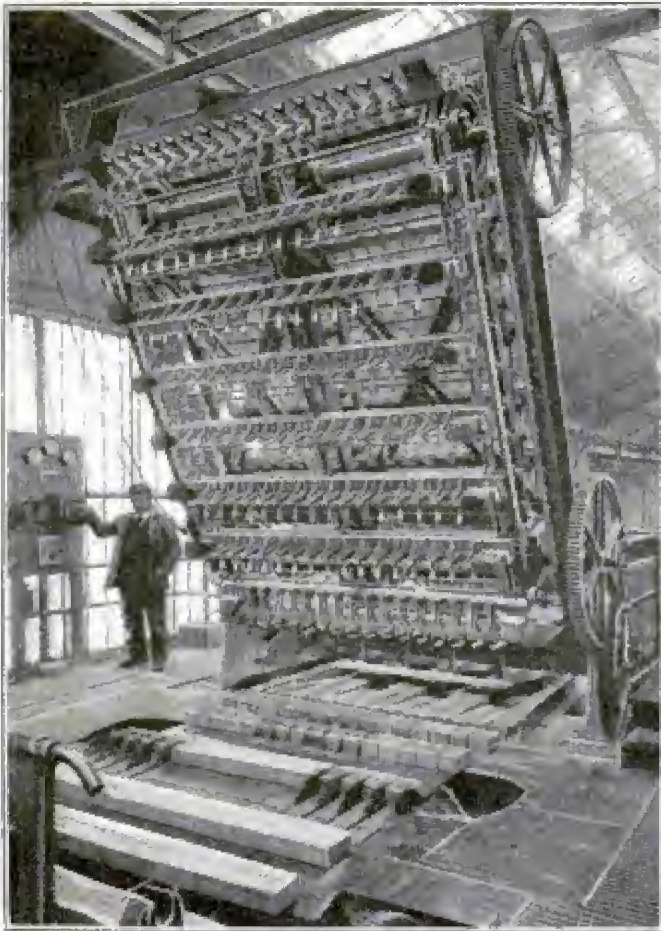


Method of Packing Tools in New Army Tool Chest

on an ordinary baggage wagon. The chest was designed by a soldier in the Ohio national guard.

Experiments with canal motor barges have succeeded in England, the barge used being 71 ft. long, 7 ft. beam, which, with a cargo of sugar, made a trip from London to Birmingham at the rate of 3 miles per hour, at a cost of 2 cents per mile.

NEW MACHINE SAWS 240,000 PAVING BLOCKS PER DAY



New French Paving-Block Machine. Endless-Chain Conveyor Raised to Show Saws and Combs

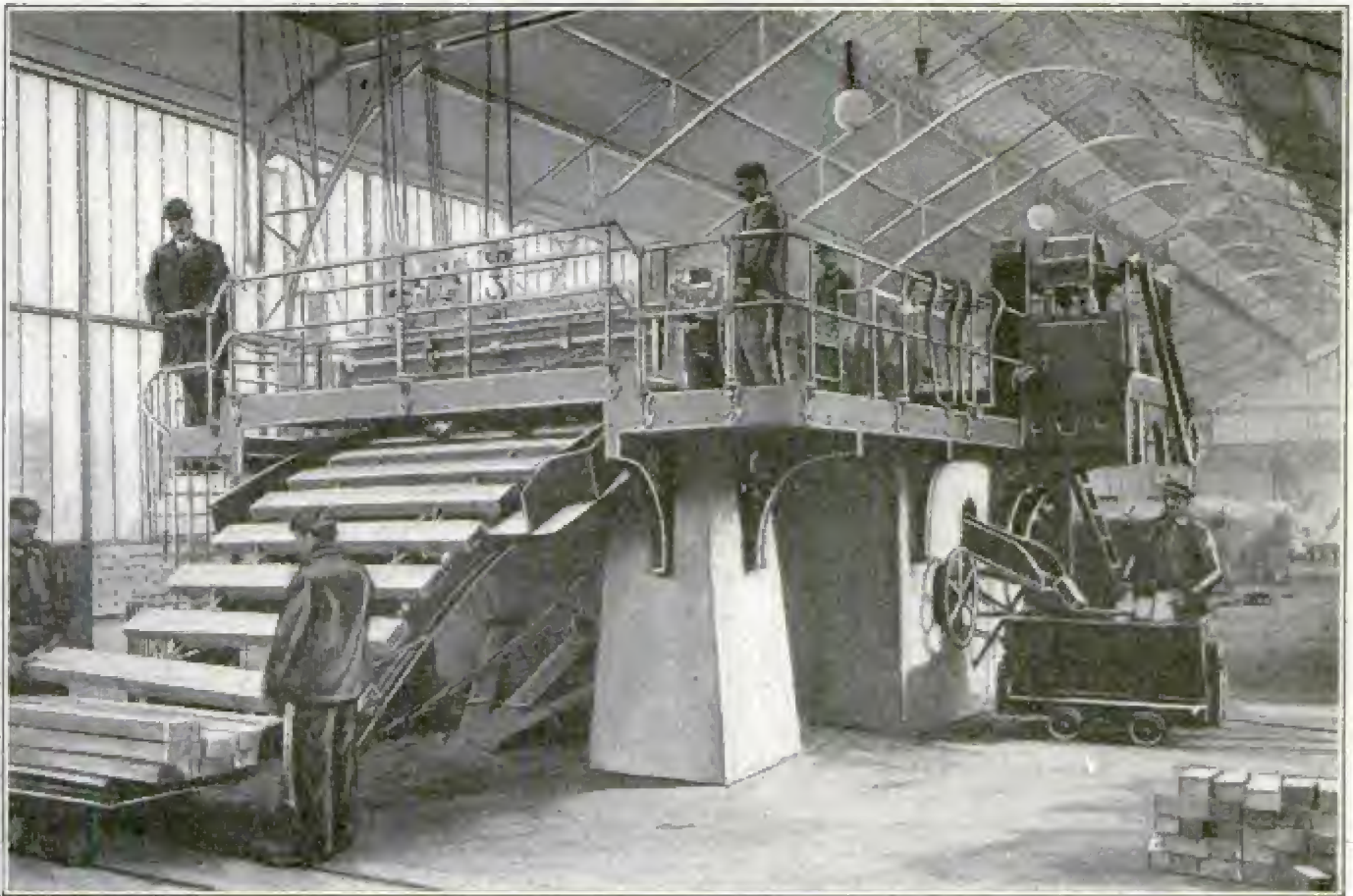
The director of the municipal workshops of Paris has invented a block-cutting machine that turns out 24,000 wooden paving blocks per hour. It is 100 ft. long, and has 17 circular saws about 25 in. in diameter, mounted on three shafts, two of which are on a line, while the third is set further back. This arrangement was adopted to avoid the excessive vibration of a single shaft. The saws protrude through slits in the table and are driven at 2,000 revolutions per minute.

The planks to be sawed into blocks, which are later creosoted, are brought to the machine on platform cars and lifted by hand onto the conveyor feeding the machines. Two sheet-iron guides keep the planks in register and assure their proper delivery to the horizontal table. The planks are then pushed along the table by combs of 16 teeth, attached to endless chains. In front of each tooth of the combs is a

spring, and the function of these springs is to keep the planks, before sawing, and the paving blocks, after sawing, pressed to the table. Near the end of the table, where the combs and springs rise and abandon the blocks, the latter are held down on the table by a set of small wheels mounted on springs. Each comb carries two little brushes, which sweep all the waste into holes at the sides of the table.

Each of the two sets of saws which are in line contains five saws. Each cuts a waste end or trimming and four blocks from the plank. These two sets attack the plank simultaneously, then the middle portion of the plank passes on between them to the third set, which comprises seven saws and divides the remnant into eight equal blocks. The 16 blocks thus cut from each plank continue to advance along the table, pushed by the teeth of the conveyor and held down by the springs until they come under the spring wheels, where they remain until pushed onward by new arrivals. When they reach the end of the table they slide down two inclined planes, enter a conveyor, are thrown into cars by eight workmen, and are then hauled to the creosoting establishment. The machine is operated by a 110-hp. electric motor, and 20 men are required in handling the blocks.

The procedure of turning out creosoted paving blocks in this country is somewhat different. It is true there are no sawing machines at present in use here having an output near so great as this new French machine, but, taking the American process as a whole, it is probably more economical and time-saving than the French system. In the operation of the French machine and the handling of the blocks, 20 men are mentioned. In this country the method is almost entirely automatic. From the time the planks enter the machines to be sawed into blocks they are not touched again by human hands



Planks Being Fed to the Paving-Block Machine, and Finished Blocks Being Dropped into a Car, Ready for Treatment with Creosote

until delivered to the paving contractors. Conveyors carry the blocks from the sawing machine to special cars into which they are dumped, and the cars are pushed into the creosoting tubes for treatment of the blocks. Then

when the blocks have become sufficiently treated, the cars are drawn out and hauled into position for automatic unloading into the railroad cars in readiness to transport them to any part of the country.

PATENTS ISSUED BY THE CONFEDERACY

Little is known about the Confederate patent office. Indeed, it is doubtful whether the army of present-day inventors and patent attorneys have even given the matter a thought, but it is nevertheless a fact that the government of Jefferson Davis, at Richmond, had a duly organized and accredited patent office, in charge of a Commissioner of Patents, which was competent to examine applications and grant its citizens protection from infringement. It is true that this protection was short-lived, but the outcome of the war was unforeseen by the founders of the Confederacy in 1861, and with the sublime confidence that characterizes the American, whether

he dwells north or south of the Mason and Dixon line, they granted P. R. Clements, of Eufaula, Alabama, a patent under which he was to enjoy exclusive rights to manufacture, use or vend an improvement in waterwheels. The period granted by the Confederacy was 14 years.

The original of this Patent, No. 13, is the cherished possession of a Washington patent attorney. Yellow with age and with the ink fading almost into invisibility, it is believed to be the sole existing reminder of the Confederate patent office; that is, the only one at present available. The fact that it was numbered 13 proves that there must have been 12 other patents granted be-

fore it, but for what devices they were issued, and to whom, no information seems available. Mystery also surrounds the successors of No. 13, yet it is not believed that P. R. Clements was the last man to receive a patent, since this patent was granted in the earlier days, and the office must have flourished after Aug. 23, 1861.

NO ELECTRIC RESISTANCE AT ABSOLUTE ZERO?

Professor Onnes, of Leyden University, has subjected a thin filament of mercury to the extreme low temperature of 454 deg. below zero, Fahrenheit, which is within a few degrees of absolute zero. At this temperature he found that its resistance, which was 173 ohms at 32 deg. F. and 40 ohms at minus 40 deg. F., had fallen to less than the ten-millionth part of the latter fig-

ure. The resistances of other pure metals follow the same law. Practically, this fact has little value; it could not be economically applied to electrical transmission lines, but in the laboratory it would be possible, for instance, to produce magnetic fields of very great intensity by cooling the windings of an electromagnet with liquid air. Generally speaking, the phenomenon is interesting because it seems to indicate that at absolute zero, could this point be reached, the resistance of conductors to the electric current might be found to be, itself, zero. The point called absolute zero is 459.6 deg. below zero Fahrenheit, at which heat is assumed to cease entirely to exist.

CMaurice Farman, one of the pioneer French airmen, has covered, altogether, more than 40,000 kilometers (24,850 miles) in his flights.

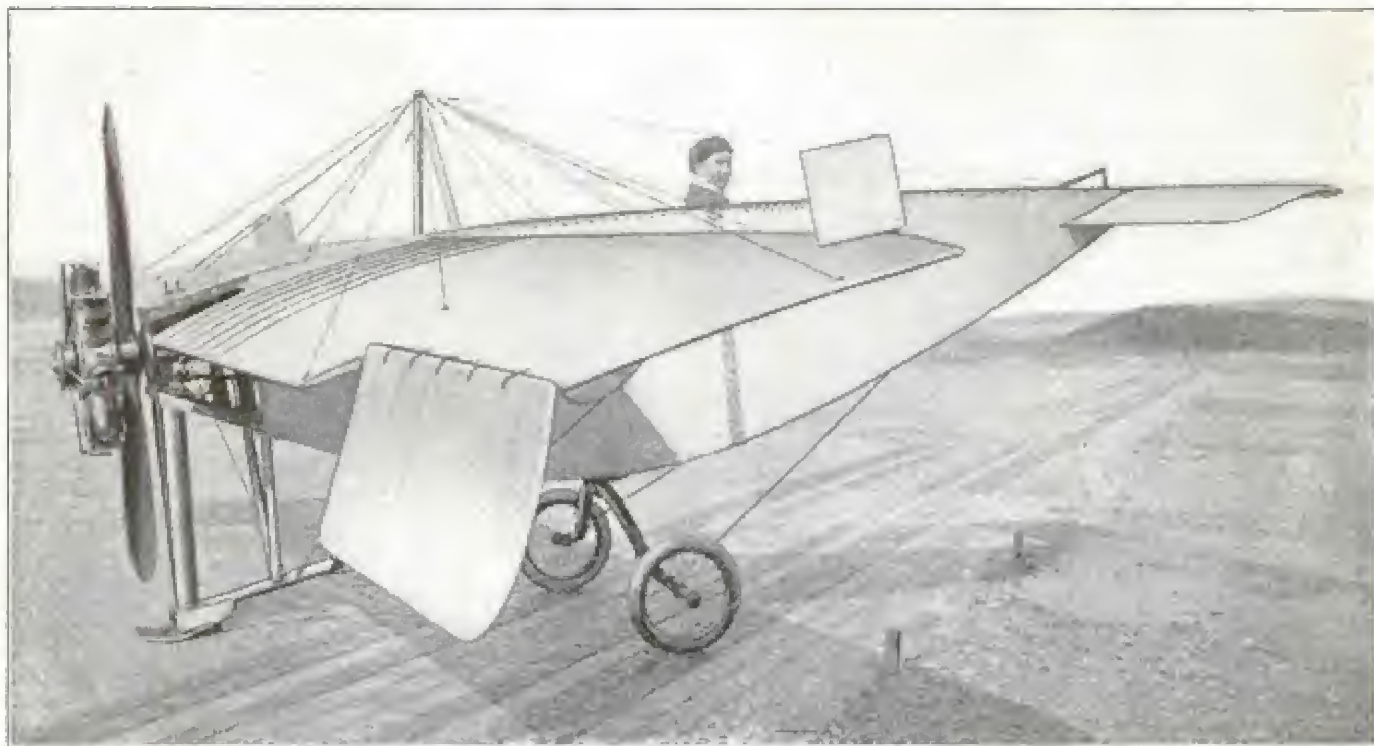


The Hole in the "Olympic," the Damage Below the Waterline being Much Greater Than That Above



The Bow of the "Hawke," the Damage being so Great That the Ram Has Been Mashed Flat

The damage to the hull of the liner "Olympic" in her collision with the protected cruiser "Hawke" was found to be much greater than was at first supposed and it may require several months to make repairs. The hole in the hull extended for some distance below the water line. The "Hawke," too, was badly injured, the fore part of the cruiser having been twisted into a shapeless mass, and her "ram" practically crushed flat. It is a remarkable commentary on the character of the construction of the modern ocean liner that the "Olympic's" injuries were slighter than those of the warship with a ram and bow especially built for running down and sinking other warships.



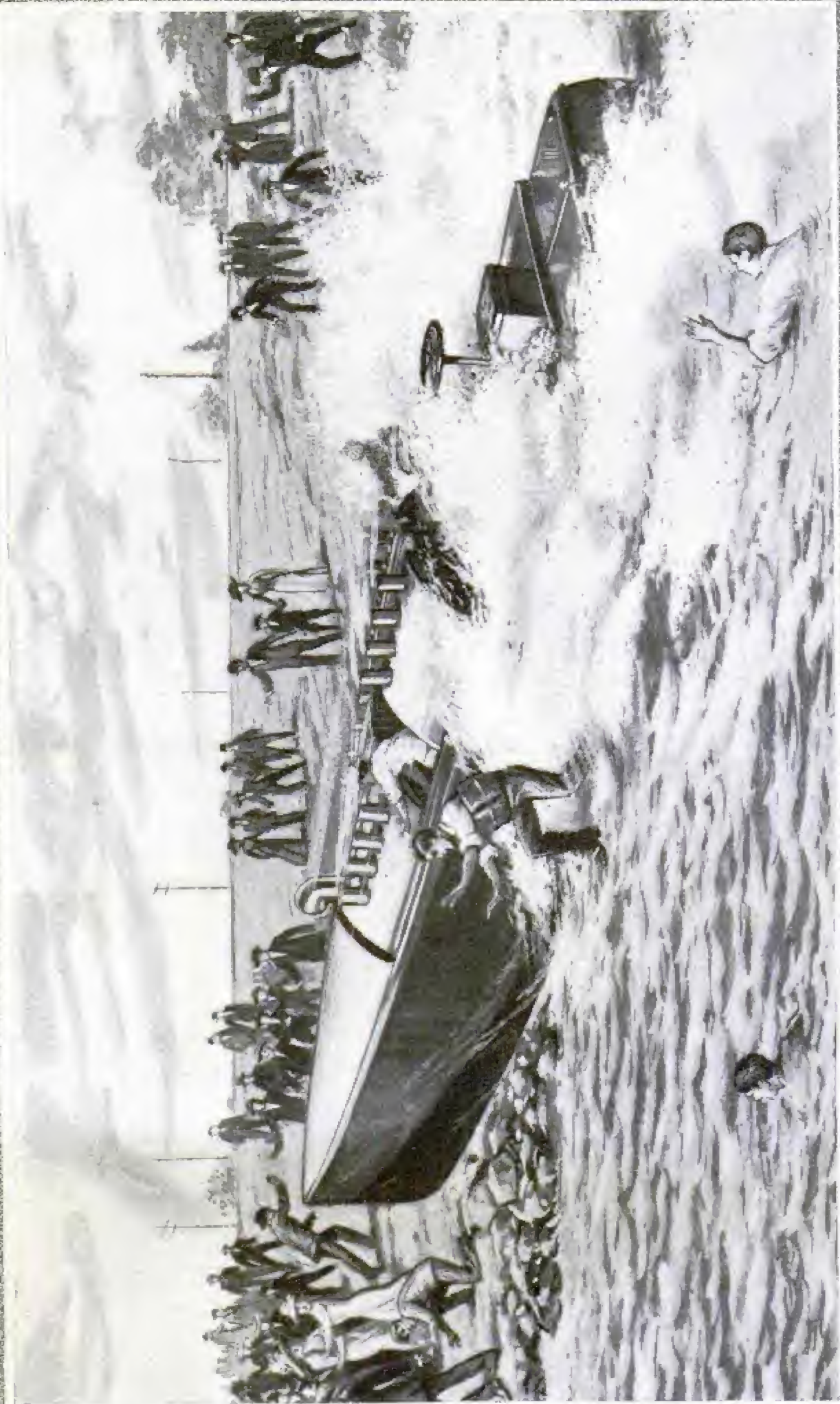
Louis Bleriot, the French aeroplane builder, has just brought out two new types of machines, both of which have made creditable flights. The new "Canard" (Duck) contains



many innovations in the shape of the body, the method of stabilization as applied to monoplanes, the position of the propeller behind the pilot, and the construction of the landing wheels.



Racing Type Which is Expected to Make Great Speed



World's Champion Motorboat, "Dixie IV," as She Appeared after Jumping from the Niagara River to the Beach near Buffalo, N. Y.

MOTORBOAT JUMPS FROM RIVER TO SHORE

Marine records were broken on the Niagara River, at Buffalo, recently, when Frederick K. Burnham's speedboat, the "Dixie IV" swerved from her course, while competing in a 35-mile race for the championship of the United States, and, while going at a rate of 40 miles an hour, hurled herself high and dry on the rock beach, crowded with spectators, and injured two boys and one woman.

What caused the accident was never learned, but the owner stated that some slight obstruction might have been hit while making the turn, which swerved the boat beyond control. Nothing was wrong with the rudders or the appara-

tus that worked them. Five persons were in the boat at the time of the mishap. Two jumped overboard, when they saw what was going to happen, and the three that remained in their seats were uninjured, though much shaken when the boat hit shore.

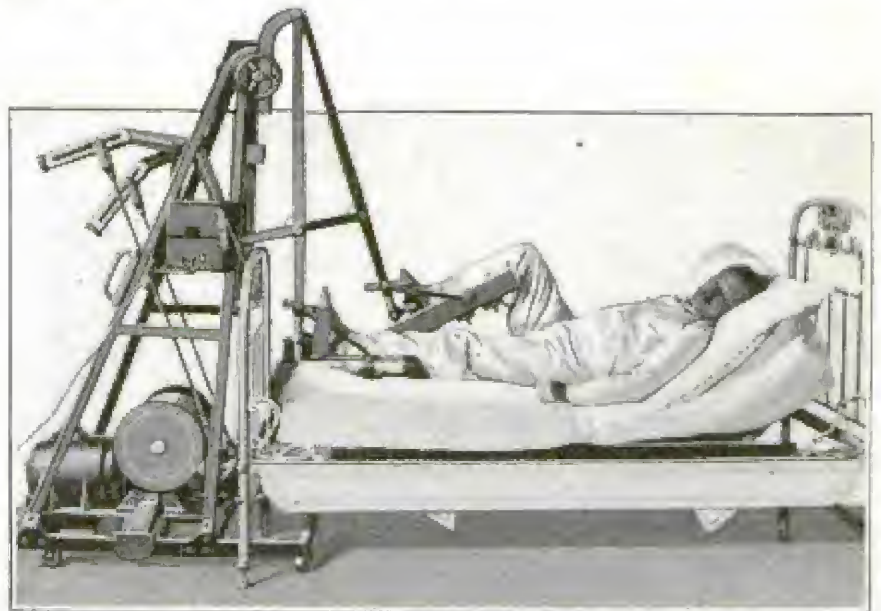
The people injured were spectators at the race who were struck by the boat as she leaped ashore. One of the boys was crushed under the bow and the other boy and the woman were knocked down.

Just a week previous to the accident, the "Dixie IV" won the international motorboat championship race at Huntington, L. I.

QUART OF HONEY MEANS 48,000 MILES' FLIGHT

A bee culturist has figured out some very interesting data concerning the work of bees in gathering honey. He calculates that a quart of honey represents no less than 48,000 miles of flight between the hive and the flowers. Also, that in June, which is the busiest month of the season, the workers of one colony easily cover as much as twice the distance between the earth and moon in one day. The distance of the moon from the earth is 237,600 miles. Therefore, the gathering of about 10 quarts of honey means, totaling the flight of all the workers of the colony, a flight of some 475,200 miles.

set in motion by a small electric motor. When the patient wishes to take a "walk" in bed he starts the motor by pulling a cord. The regulating mechanism is arranged so that he can govern the speed, taking a brisk or a slow "walk."

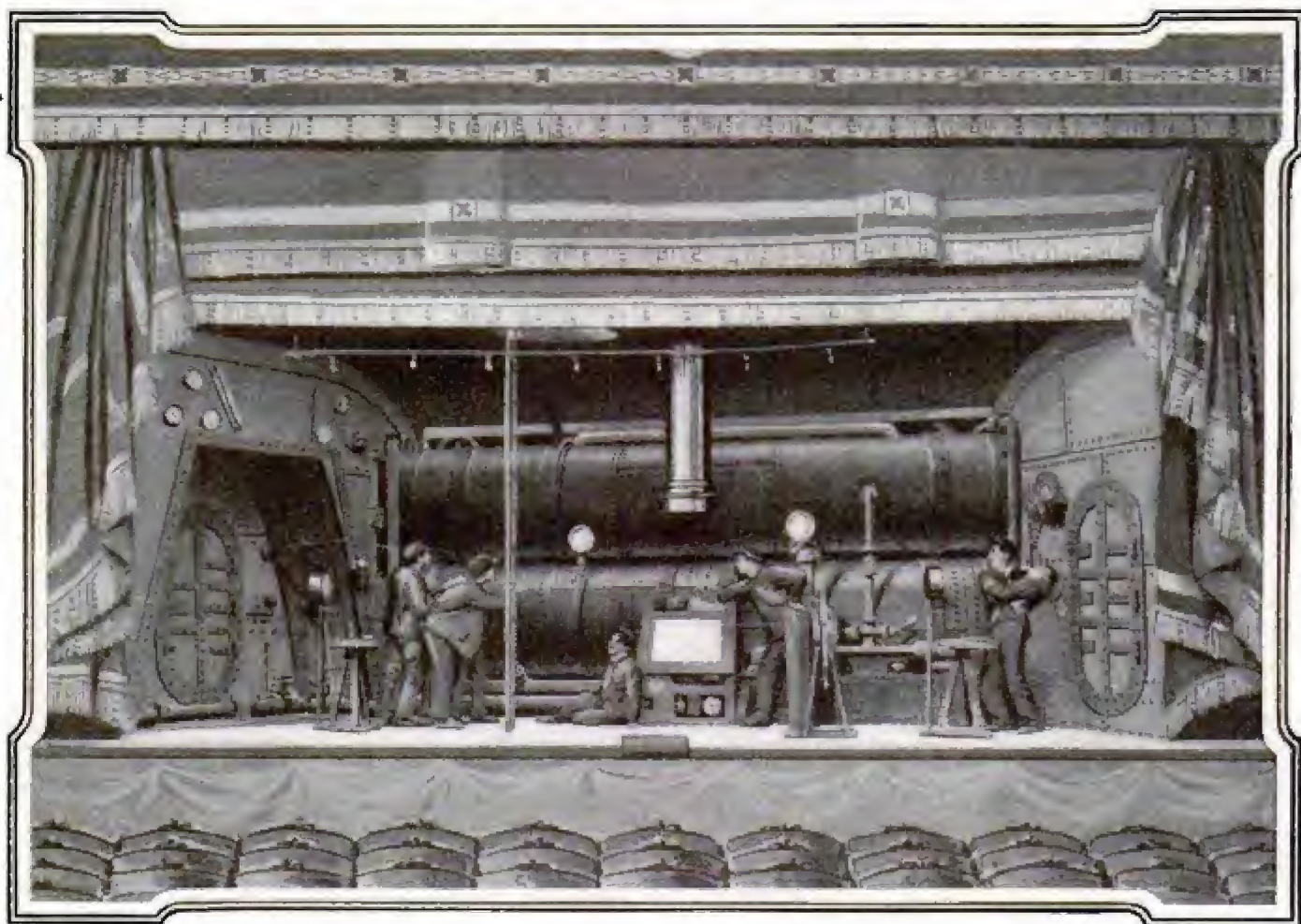


An Apparatus Which Gives the Bed-Ridden Patient Walking Exercise

WALKING EXERCISE IN BED

A Vienna physician has designed an apparatus by means of which the ill can get the benefit of physical exercise without leaving their beds. The feet are fastened to long levers, which are

ⒸThe United States army and navy, in conjunction with the government of the Philippine Islands, contemplate the construction of a complete wireless system for the Philippines which will have 13 high-power stations and 14 intermediate or low-power stations.



A SUBMARINE SETTING ON THE STAGE

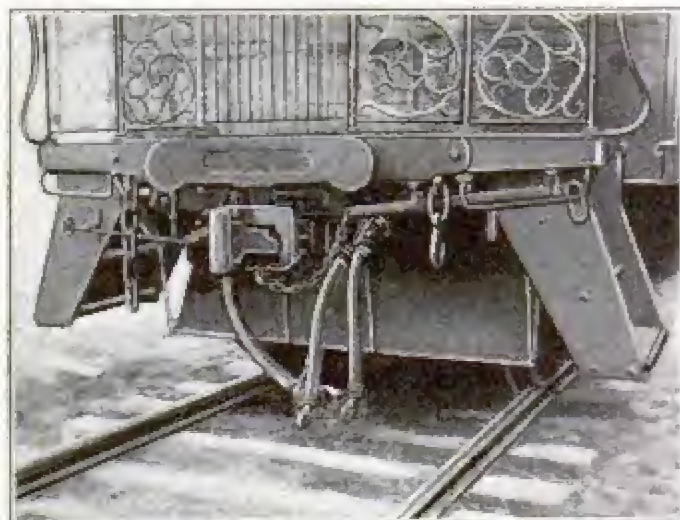
Detailed construction of the interior of a submarine is staged in a recent production shown in Paris, called "Le Sous-Marin L'Hirondelle," (The Submarine "Swallow"). This is probably the first time that the dramatic possibilities of the submarine have been drawn upon.

DUST DEFLECTOR FOR ENDS OF TRAINS

The platform of the rear coach is, as every one knows, the dirtiest place to ride, upon the whole train. The dust and dirt curling up from the wheels of the car settle around the

platform. The deflector shown in the illustration is the idea of a division superintendent whose inspections of the road kept him much of the time upon the rear platform of his car, which was usually the last one in the train.

It is simply a light framework of iron strips, covered with heavy canvas, and secured to the sills of the car. Its lower edge is near the rails, and in the creation of a secondary current of air it forces the dust to arrive behind the car from out of the limited space below the apron, which is so low that by the time the dust can rise the car has left it far behind.



Dust Deflector below Rear End of Observation Car

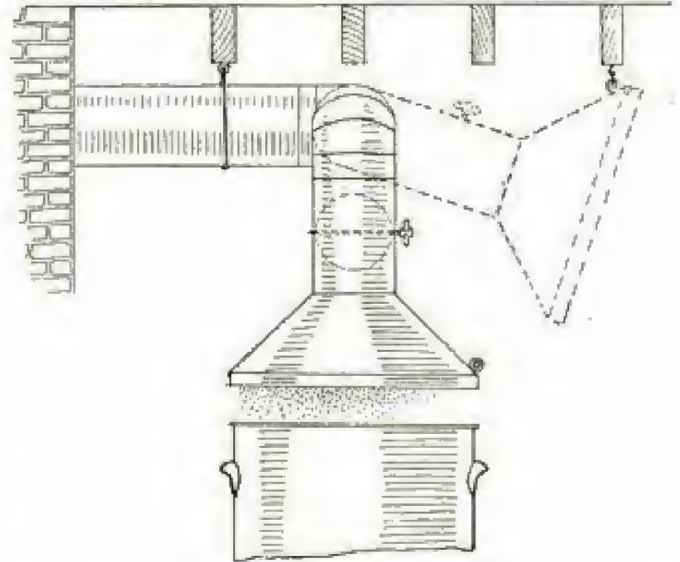
So great has the molasses trade of Hawaii grown that the product will hereafter be exported in a tank steamer, an old vessel being reconstructed to meet the special demands of the trade in this particular.



Ash-Can Dust Absorber

The dust rising from cinders taken from a furnace will, in a short time, cover everything in the basement with a coat of fine ashes and many times it gets into the rooms on the first floor. A great deal of this fine dust can be disposed of, if the ashes are put into a can which is directly located beneath a large funnel covering having pipe connections to the chimney.

The pipe must have two elbow joints and a connecting short piece so that the funnel-shaped covering can be turned up and away from the can top, as shown by the dotted lines in the sketch. The pipe and funnel are turned up when the can is taken out for emptying. A damper is placed in



Position of Hood over Can

the pipe so it can be turned to prevent a draft when not in use.—Contributed by John Blake, Franklin, Mass.

Wheels on a Shop Stepladder

A ladder with wheels is very handy for the oiler, as it saves considerable time in moving it from place to place. The ordinary wheel attachments are

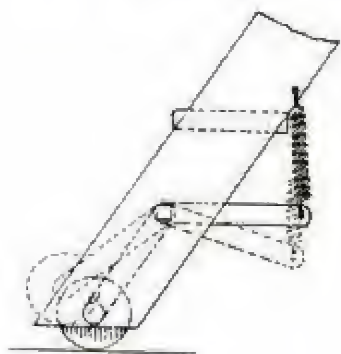


FIG. 1

Wheels on Ladder Legs



FIG. 2

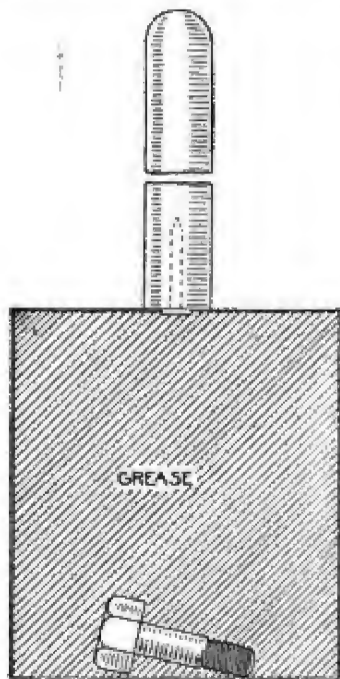
Fig. 1, a wheel attachment is shown which has a spring strong enough to carry the weight of the ladder, but will allow the wheel to rise under the weight of a person. This causes the ladder ends to come in contact with the floor and makes it impossible to move the ladder while the oiler is at the top. The wheels on the vertical supports are attached as shown in Fig. 2.—Contributed by D. J. McKenna, New Britain, Conn.

objectionable as the ladder is liable to move on an uneven floor when the oiler is at work. In the illustration,

Can an adjustable water drip for a grindstone can be made by sewing the ends of several pieces of burlap together, wide enough to fit in a can, and long enough to hang below the bottom on the outside. If water drips too fast, strips of the burlap can be folded back.

Substitute for a Small Lifting Magnet

A device that is quite useful and will take the place of a magnet for picking up small pieces, such as bolts, nuts, plugs, or anything not weighing over $1\frac{1}{2}$ lb., can be made of a long stick on the end of which a can is fastened and filled full of hard oil or grease.



Some small tool or part of machinery often falls, when making repairs, into a place from which it is

hard to recover, and sometimes this will cause the dismantling of the different parts to get it out. When this happens, a magnet comes in handy. If a magnet is not at hand, the device described and shown in the sketch is a very good substitute. If the parts are brass, then this substitute will lift them where a magnet would not attract them.

The device is made of an ordinary tin can with one end open and the other nailed to a slender stick, the can being filled with hard oil or grease. When the can is pushed down on the dropped part, the grease will pick it up.—Contributed by Joseph Oleson, Milwaukee, Wis.

Protecting Automobile Engines from Intense Cold

One difficulty in running an automobile in the winter is to keep the engine from getting too cold and the carburetor from becoming covered with frost. This trouble can be avoided by making a heavy wire frame the same shape and size as the radiator front and covering it with dark

bunting which will make it look like a sieve. Fasten a strap around the wire at the top and buckle it around the water filling cap. Attach straps to each of the lower corners for buckling to the automobile frame or lamp brackets.

The bunting will stop the cold air rushing through the radiator and will shield the engine. The engine will then keep the air in the hood warm and the frost away from the carburetor. In very cold weather several layers of bunting should be used.—Contributed by Earl R. Hastings, Corinth, Vermont.

An Air Compressor

A simple air compressor that will produce about 50 lb. pressure in a tank can be constructed with two ordinary cast-iron open-well pump cylinders, $2\frac{1}{2}$ in. inside diameter, and pipe connections. These cylinders can be purchased cheaply, complete, including guide rods and plungers. Packing boxes, A and B, Fig. 1, from old discarded valves are fastened into the tee connections on the end of the pipe C. The valve rods D and E pass through the packing boxes and are attached to a device for driving the pistons F and G. The pipe connections on the ends of the cylinders have two inlet check valves, H and I, and two outlet valves, J and K, to the pipe L attached to the tank.

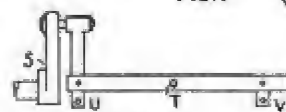
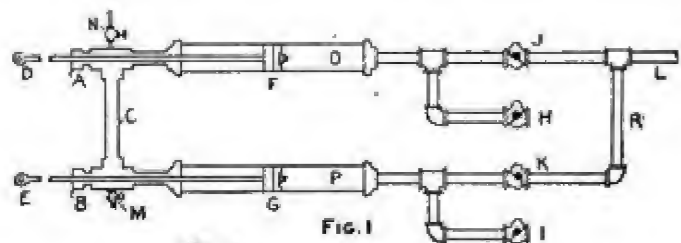


Fig. 2
Pump Cylinders and Pipe Connections

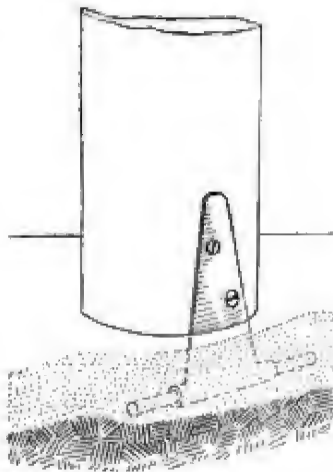
The cylinders are cooled by water in the pipe C, which is regulated by the valve M. The water outlet is through the valve N. These valves

should be regulated so that there is no pressure on the water to keep it from entering the air chambers O and P.

A crank arrangement can be fixed to operate the compressor from a shaft as shown in Fig. 2. The crank S operates an arm pivoted in the center at T. The plunger ends D and E, Fig. 1, are attached to the projections U and V, Fig. 2.—Contributed by J. S. Noble, Toronto, Ont.

Anchoring a Post to Concrete

Wood posts may be attached to concrete floors by setting one-half of a heavy hinge in the wet concrete, allowing sufficient length above the surface to admit two of the screw holes. When the cement is dry the post can be fastened to its support with screws. The hinge can be reinforced by inserting a piece of rod iron into the hole before the cement is tamped in around it.—Contributed by Paul H. Burkhart, Blue Island, Ill.

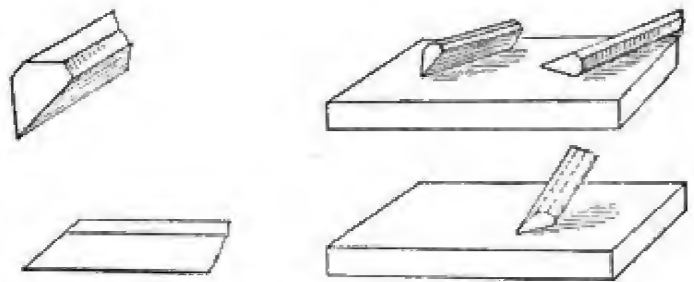


Bright Cutting on Aluminum

Grind the face of the graver in the direction of the lines, as shown in the sketch, to an angle of 45 deg. Use a fine oilstone wheel without oil. Leave the face of the graver rough and remove the bur by jabbing the end into wood. Polish the sides as shown on a hard oilstone which has had some brass rubbed into it and has been used without oil. Draw the graver from the heel toward the point to sharpen the cutting edges. Keep it moistened with pure vaseline. If the face of the graver is not polished, the metal will

not adhere to it, thus allowing the chips to roll off from the point.

This method of sharpening applies to tools for cutting any kind of jew-



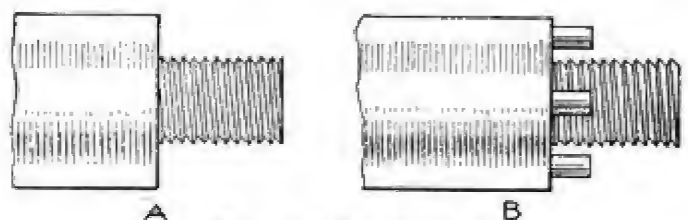
Whetting the Graver

elry except turning gravers. Turning gravers for cutting bright on brass or steel may be polished as described and given a very keen edge by drawing the face the same as the sides over the stone.—Contributed by Geo. W. Coplin, Bay City, Mich.

A Nut Arbor

Nut arbors are used to turn up pieces having threaded holes. The most common form of an arbor is shown at A in the sketch. This form has the objection of making it necessary to use a collar for the work to fit against, or the threads must be recessed in the work so as to have a close fit, or else the threads must be cut out close to the shoulder on the arbor.

An arbor made as shown at B does not have the objections mentioned. After the threads are cut on the arbor, four holes are drilled longitudinally in the shoulder and pins driven in tightly. The arbor is then put in a lathe and the pins faced off true. This makes an

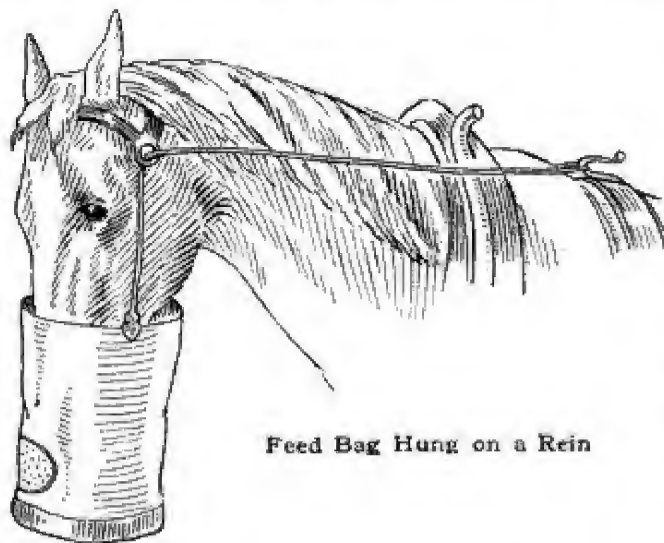


Pins in Arbor Shoulder

arbor that is good for any kind of work without resorting to collars and recesses.—Contributed by Donald A. Hampson, Middletown, N. Y.

Adjustable Feed Bags for Horses

When the feed in the ordinary feed bag gets too low for the horse to reach easily, he either throws his head up or sets the bag on the ground to get

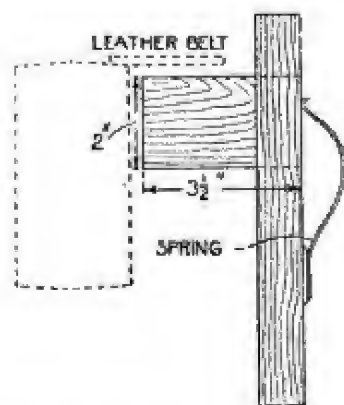


Feed Bag Hung on a Rein

the grain. In either case, much of the food is wasted. The illustration shows a feed-bag holder on the principle of a rein, which quickly adjusts the level of the grain to the mouth of the horse by a slight movement of his head downward. The sketch fully illustrates the construction of the head-gear and the rein connection.—Contributed by Leonard L. Miksch, Buffalo, N. Y.

A Belt Stick

The belt stick shown in the accompanying sketch consists of a long handle made of wood with a square



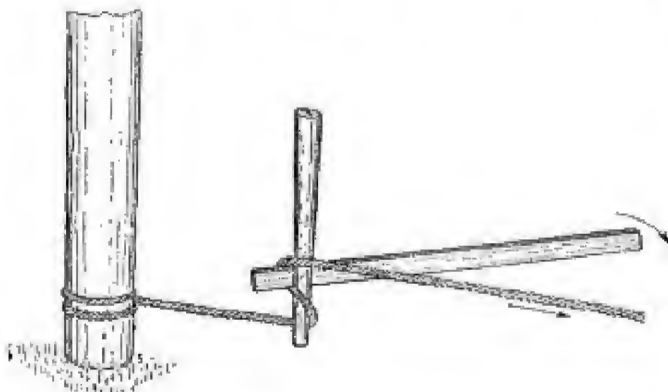
hole mortised in its upper end and a block, $3\frac{1}{2}$ in. long, fitted to slide easily in the mortise and held in place with a spring. The block is kept from slipping

through the hole by cleats or screws placed on the top and bottom sides of the block and entering a recess cut in the handle.

When a belt slips off a counter-shaft pulley, all that is necessary is to put the block under the belt and press the shifter stick on the side of the pulley. The block naturally slides back against the spring, leaving the belt free to slide on the pulley.—Contributed by Harry L. Berry, Philadelphia, Pennsylvania.

Pulling an Automobile Out of a Rut

There is a handy way of getting an automobile out of a rut if you are fortunate enough to have a rope along and the rut happens to be near a telegraph pole or tree, says the Automobile. The accompanying sketch depicts a method which was much used in the old days of the horse. A turn



Position of Lever for Taking up Rope

is taken about a convenient tree or post, then a smaller pole is placed in the position shown, to act as a fulcrum for the lever pole. In this way quite a purchase can be obtained, and if the rut is not too deep and the car not too heavy, so that the rope will not break, the car often can be withdrawn.

Quickly Made Tool for Bending Pipe

A pipe bender can be made by boring a few holes in a piece of oak plank and inserting heavy bolts or short pieces of pipe for pegs, about which the pipe may be bent as desired.

Ⓒ Rivet heads should be kept well below the surface on leather-faced clutches.

Stencil Making

By HOMER H. KNODLE

PART I—Designs

Painters, decorators and practically everyone have at some time or other felt the need of a good stencil to produce artistic duplication and were unable to make one because they did not know how to do it. Stencil making is quite simple and a few suggestions as to the methods of designing and the operations in cutting them will enable anyone to make them for pleasure or for profit.

The only tool necessary is a good sharp knife, preferably with a rounding point. The material used for a stencil is a heavy grade of tag or manila board which can be secured of a local printer or at a drug store. A small amount of boiled linseed oil will be required to coat the finished work, and, aside from the drawing tools, will be all that is necessary to do the best work.

A drawing board is necessary for designing, which must be as large as the largest size stencil to be made, a T-square, triangles, one 30 and the other 45 deg., and a set of drawing instruments. A fair grade of instruments amply accurate for this rough drafting should not cost over \$3 for the set. A box of 2-oz. tacks will be needed for fastening the paper or tag board to the drawing board.

A very simple design consisting of a square block connected by a bar, which will serve very well for practice work, is shown in Fig. 1. This is first drawn on stencil paper by dividing the horizontal lines into equal squares, then forming the blocks and connecting them with the bars, using the 45-deg. triangle on the T-square. When drawn as shown, it is ready to be cut. This design does not require binders.

In Fig. 2 is shown another simple scroll design without any binders, intended for practice work. The design is first drawn in rectangles and then

the scroll is drawn in freehand, finishing with the dots at regular intervals. The designs in Figs. 1 and 2 should not be made more than 2 in. wide.



FIG. 1



FIG. 2



FIG. 3



FIG. 4



FIG. 5

Simple Designs for Stencils

The design shown in Fig. 3 is made up of circles which contain some black and some white. The black represents the part to be stenciled in all cases and in this particular design the white space in the circle must be held firmly in place. To do this a narrow strip, called a binder, must remain in the black surface (in this, a part of the enclosing circle, as shown at A) to hold the white crescent-shaped piece in place. When through stenciling, the uncolored part under each binder may be painted or not as conditions suggest. The binders are necessary in all intricate stencils and they must be placed as inconspicuously as possible and yet hold the part firmly.

Another practice design is shown in Fig. 4 which eliminates the binders. The method of drawing is simple spacing and duplication. This design should not be over 2 in. wide or its effect will be ordinary. It is especially adapted to be cut about 1 in. wide and used in connection with another bold

design as a border or liner to mark the line of stenciling.

Some scroll work is introduced in the design shown in Fig. 5, which will give a beginner a chance to become proficient with his knife. The light scrolls will be good practice, but the main part is a good design for anything requiring a tasteful border.

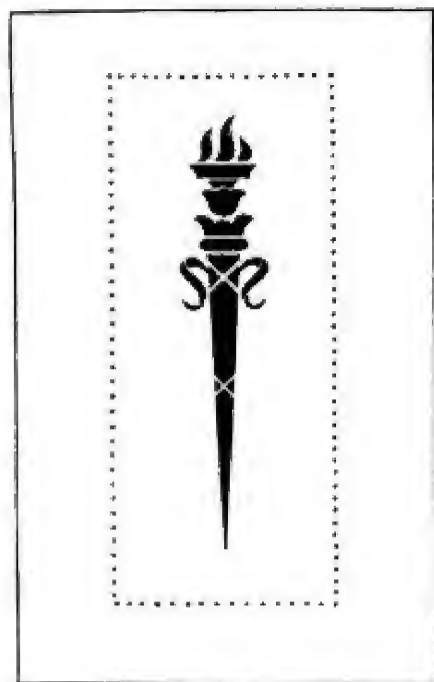


FIG. 6



FIG. 7

Panel Designs

A panel design is shown in Fig. 6, which should be made in proportion of about four times its width in length. This is used for panel decoration and often several of the panels are combined to make a circular ceiling design. Circumstances will not permit its use in all cases, as the finishing border must fit. The best size for this design is 6 in. wide and 24 in. long. The design should occupy the position shown on the stencil and the dots should be cut out $\frac{3}{8}$ in. in diameter. Another panel design is shown in Fig. 7, illustrating the difference between a bold and a light effect. While the design shown in Fig. 6 would serve on a small panel, it might be out of place on a large one. The design in Fig. 7 would be more appropriate for the latter. The binders shown crossing the designs are not there of necessity but for ornament.

A wreath design which can be adapted to almost any place is shown

in Fig. 8. Stenciling a series of these designs about a center will make a nice circle to contain a center piece. It will serve equally well as a border. A pretty border can be made by placing a plain line on each side of the wreath or a design similar to Fig. 1 may be used. The wreath design should not be made smaller than 6 in.

or larger than 20 in. The dots forming the double circle should be $\frac{3}{8}$ in. in diameter for the larger sizes and reducing the diameter for the smaller sizes down to $\frac{1}{16}$ in.

Another border design which should not be made over 3 in. wide is shown in Fig. 9. The scrolls are sketched in first, then the dots and then the small squares. The border design shown in Fig. 10 is for practice in cutting rather than a design for stenciling.

It may be used in places requiring a very light design with little ornament.

Figure 11 shows a bold design of a center piece which will prove valuable for places requiring a heavy design of medium size. This design should not be less than 12 in. wide on the base and never over 30 in. It will give a very good effect if used with a darker tone of the body color and edged with a contrasting color. Binders will be necessary and these should be painted over after stenciling so important a piece as this one shown.

To lay out the design, mark the bounding circles first and then use the two triangles to draw the centerline of each bar as it appears in the sketch. Sketch in the outline of the bar at equal distances on either side of the centerline. Continue this over the entire design, sketching in the ornament around the border last.

When a stencil is finished remove it

from the board and place it in some convenient place and give the surfaces a coat of linseed oil. This serves to

rough and cannot be trimmed without destroying the symmetry of the design. Constant practice on the simple



FIG. 8

Designs for a Center Circle and Borders



FIG. 9

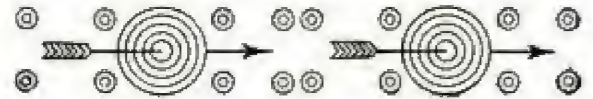


FIG. 10



FIG. 11

keep it and finishes the stencil. The knife should be very sharp and kept so, as a line cut over twice is always

designs will soon enable one to work on larger and more intricate work.

(To be continued.)

Repairing a High-Pressure Hose

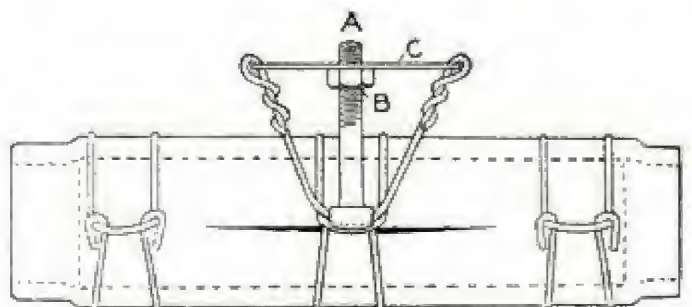
A hurry-up job had to be made on a high-pressure hose which was used in connection with a water-turbine boiler-tube cleaner with water at 150 lb. pressure per square inch. The hose had a split about 2 in. in length. The hose could not be cut off, as it would be hard to hold together under the working pressure, says a correspondent of Power.

The repair was made quickly by splitting the hose for a distance of about 5 in. on each side and inserting a nipple about 10 in. in length, first pushing it into the hose on one side of the split until the other end would enter the hose. Then the nipple was centered in the cut section. The two sides kept it from pulling apart.

The clamps used to make the connection water-tight were made of wire as shown in the illustration. When the wire was drawn tightly, the tool

was pushed forward, thus hooking the two ends over the bight of the wire.

If wire of high tensile strength is



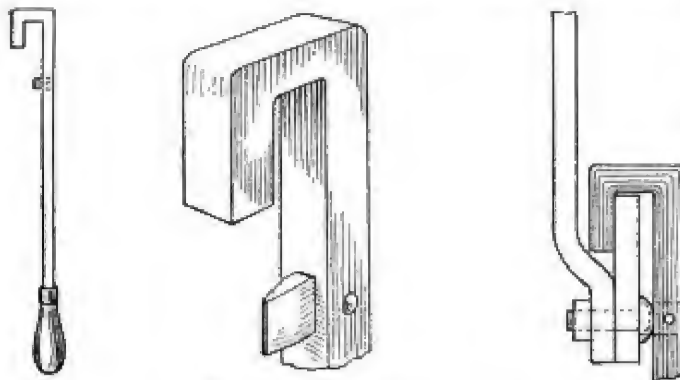
Clamping Hose with Wire

used and a little care exercised in getting the wires straight, a permanent job is usually the result. A great deal depends, of course, upon the workmanship.

Spots on varnish can sometimes be removed by rubbing them well with a soft rag saturated in boiled linseed oil.

Holding Screws When Repairing Beef Tracks

The condition of the atmosphere about beef tracks soon rusts all nuts on screws and bolts. In making re-



Screw-Holder Lever

pairs it is difficult to remove a nut without some means of holding the screw to prevent it turning with the nut. The leverage on an ordinary screwdriver is not sufficient to hold the screws, therefore I made a tool as shown in the sketch, the end of which is bent and fitted with a screwdriver end as shown in the enlarged view. The method of holding the screw is clearly shown.—Contributed by I. B. Spittel, Baltimore, Md.

Removing Rust Pits in a Rifle Barrel

The rust and pits on the inside of rifle barrels can be removed without rounding the edges of the rifling, with a tool of babbitt metal made to fit the bore of the rifle.

This tool can be made by inserting a wad of paper, A, about 4 in. in the barrel from the muzzle end, and a rod, B, preferably brass, held centrally in the bore while the space C is filled with melted babbitt metal. The end of the rod should be roughened or



Molding Soft Metal End on Rod

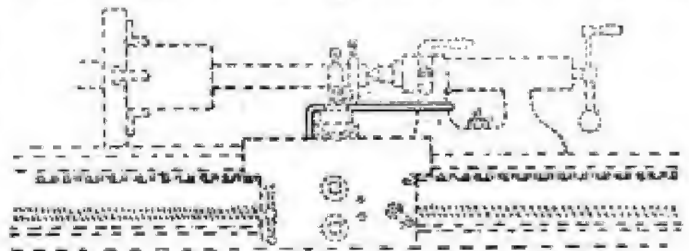
notches filed to securely hold the metal, and it should be longer than the barrel so that a loop handle can be bent in the end.

The babbitt metal will contract sufficiently in cooling to permit it to be screwed out of the barrel.

Dip the babbitt end in oil and dust emery flour over it and turn the tool through the barrel. All rust is quickly removed in this manner without damaging the rifling.—Contributed by Wilfred E. Bertrand, Philadelphia, Pennsylvania.

Drill Feed for a Lathe

Place the drill on the center with a dog as usual, then bend a piece of iron rod as shown, one end to hook over the base of the tool-post and the other to slip into the depression in the tailstock. Put a tool in the tool-post to keep the drill from "digging in" and take up the slack by screwing drill and dog up



Automatic Screw Feed for a Tailstock

tight against the tool-post. Put a slow speed on the screw feed. This will save feeding by hand.—Contributed by J. F. Tholl, Ypsilanti, Mich.

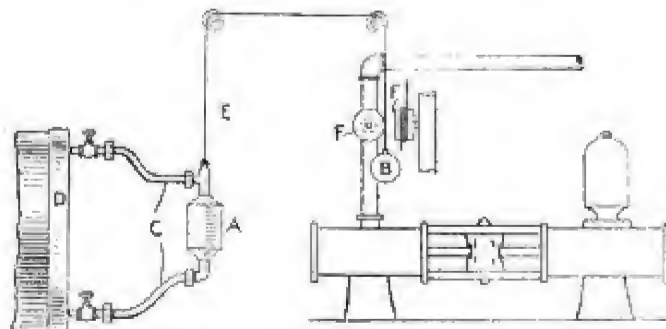
Automatic Pump Control

The device shown in the sketch is designed to control the action of a pump drawing water from a tank or hot-water receiver. It is designed to supplant the ordinary float control. The small water receptacle A is balanced, when empty, by the counterweight B. The receptacle A is filled with water through the flexible connections C as the tank fills. As it gets heavier on account of the increased amount of water contained, it slowly falls.

The flexible cord, E, by which it is suspended, is passed two or three

times around a sheave on the valve stem of the pump throttle. This winding is done in such a way that as the weighted receptacle falls the throttle valve opens. This change continues until the pump is removing water from the tank as rapidly as it comes in. Any variation in the amount of inflow is taken care of by the same process or the reverse of it. When properly adjusted the controller will maintain a level almost constant—not more than 1 in. variation being noticeable. The same device can be connected to the ordinary automatic electric motor starter and thus control motor-driven pumps of any kind.

Experienced engineers know the trouble caused by tank floats. They frequently break, and breaks are hard to discover and difficult to repair. Usually it is necessary to shut down the whole system before attempting repairs. The apparatus described may be installed, repaired or dismantled without disturbing the action of the pump or the flow of the water. It also has the advantage over the internal float of not being influ-



Substitute Float Attached to Engine Throttle

enced by the surge of the water rushing into the tank or the agitation caused by the boiling when the tank is used as a heater.

Repairing a Loose-Jointed Chair or Stool

The joints of stools and the majority of chairs are sure to become loose in time as they have no diagonal bracing, and, as time goes on, the wood of the rungs dries out and becomes smaller than the holes they fill, which

causes the chair or stool to drop to pieces, unless steps are taken to hold them together. Nails are useless as they soon work loose and screws are



Fig. 1

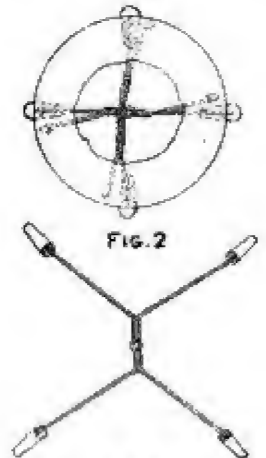


Fig. 2

Wire Braces for Stools

of little value. The following method is sure to make the most shaky chair or stool in the shop firm as new:

A section of a repaired stool taken in the plane of two opposite legs is shown in Fig. 1. To repair a stool there will be required a $\frac{1}{8}$ -in. drill or bit, a brace, a pair of pliers, hammer, screwdriver and a quantity of No. 12 gauge galvanized wire. Drill four holes diagonally through the edge of the seat at one side of each leg, so that they come out on the under side; one hole through each leg obliquely toward the center, about 10 in. below the bottom of the seat, and a similar hole in each leg about the same distance above the bottom, unless it is a very low stool or chair, in which case the latter will not be required.

Insert the end of the wire through one of the upper holes in one of the legs and through the hole in the seat edge diagonally opposite. Bend a short close hook on the end of the wire with a pair of pliers, the end of the hook being parallel to the body of the wire, and hammer this into the leg like a nail, the hook lying in the plane of the grain, that is, lengthwise of the leg. Pull the wire almost taut, leaving about 2 in. slack to spare, and cut off the wire on the outside of the seat-edge hole. Turn another hook on this

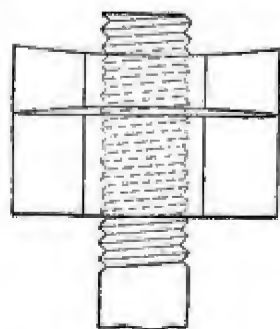
end and drive it into the seat edge, the hook in this case lying horizontal. Do the same with the diagonally opposite leg and seat-edge hole.

Take a large wire nail or screw-driver and insert it between the two lengths of wire and twist up tightly. Do the same with the other two legs and seat-edge holes, but in this case be careful to have one of the wires run over and the other under the twisted loop already formed and leaving rather more slack, because in this case two twists have to be formed in the wire on opposite sides of the first twist, as shown in Fig. 2, which is a plan view with the middle portion of the seat broken away.

The lower guying is simpler, there being only two lengths of wire, each extending between two opposite legs, and the two being twisted together as shown in Fig. 3. The whole operation takes from 20 to 30 minutes and when finished the stool is much stronger than a new one, in fact, it will hold its shape indefinitely.—Contributed by Geo. W. Colles, Milwaukee, Wis.

A Double Nut Lock

The sketch shows the principle employed. The last or lock nut is con-



caved on both sides. When set up tightly the center of the nut springs down and in a way acts similar to a spring washer. At the same time its sharp corners cut into the lower nut and hold

the lock nut in position. Extensive experiments on rail bolts have been entirely satisfactory.

ⒸRats may be caught by putting a piece of cheese in the bottom of a wide-mouthed bottle and placing it in the hole. The rat will go in, but cannot get out.

Thawing a Frozen Pipe

It is no easy task to thaw out a frozen pipe where the heat cannot be applied to the outside of the pipe. If hot water is poured into the pipe, it soon cools on the ice and accumulates in such a quantity that it is impossible to touch the ice with the hot water. A very efficient method is to insert a smaller pipe into the frozen one and pour the hot water into the smaller pipe. If the end of the smaller pipe touches the ice, the hot water will come directly in contact with it in a continual stream. This will force out the cold water and thaw the ice quickly.—Contributed by John Mason, Armstrong, Okla.

Shaking Up a Telephone

Where you cannot make your party hear over a telephone, shake it up by giving the transmitter a downward strike with the open hand. Do not abuse your telephone. If a portable or desk telephone is used, turn it upside down and then right it again.

The reason for this is that talking causes waves in the air like ripples on the water when a stone is thrown into it. In a transmitter there is a small receptacle containing fine grains of carbon. The waves of sound strike upon a disk that in turn squeezes the carbon particles together. This constant compression, together with their own weight, causes the carbon grains to settle and pack into a hard lump that does not respond to the vibrations of the metal disk. When giving the transmitter a downward strike with the hand the particles are disturbed and loosened and made soft so that they easily respond to the varying pressure caused by the sound waves. When a portable telephone is turned upsidedown, all the fine grains of carbon fall to the top of their container and as the telephone is righted they settle again, but are loose and soft.

When the carbon particles are com-

pressed, the electric current flows through the transmitter easily. When they are not compressed, the current does not flow so easily, thus the sound waves produce in the transmitter a current of varying strength that passes over the line.

The receiver consists of a metal disk and a magnet inclosed in a hard-rubber casing with a cap. The magnet draws the metal disk. The varying current coming over the line flows through coils of wire around the magnet which weakens and strengthens the magnetism and makes the disk vibrate. The disk in turn causes sound waves the same as those given into the transmitter. If the cap of the receiver is loose, the disk often touches the magnets, which prevents it from vibrating easily. In such a condition it is hard to hear your party. If the cap is screwed up tight the disk is sprung away from the magnet about $1/100$ in. and it has a hollow sound when struck with the end of the little finger. This will make the receiver produce the sound waves clearly.

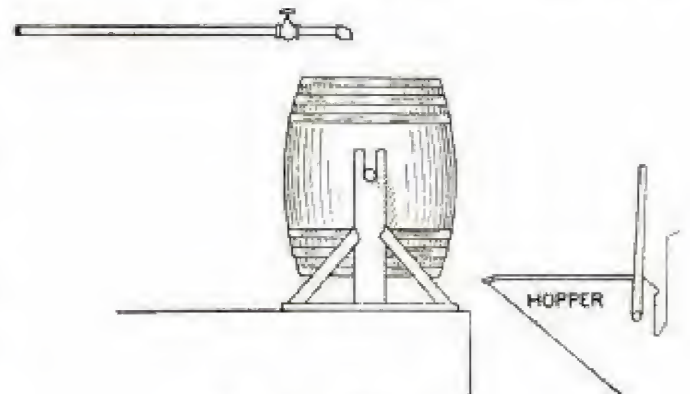
The heat of the ear expands the cap and in cooling it creeps on its threads so that it will come loose in time. This will make it sound like the party on the other end of the line is very far away. Shaking up the telephone will make your party hear you well, and keeping the cap tight will enable you to hear them well.—Contributed by E. M. Morgan, San Gabriel, Cal.

Water Barrel for a Concrete Mixer

On a concrete job, a water barrel is usually behind the mixer, and the man in charge of the mixing uses a pail to get the water from the barrel to the mixer, says a correspondent of Cement Age. The accompanying sketch shows the arrangement of a barrel mounted on a trunnion and placed to one side of the mixer. This is filled to a certain height, and when the batch is ready for the water, the barrel can be tilted and emptied easily

and quickly. This allows a measured and uniform quantity of water to be added to the mixer in the shortest time possible.

The trunnions could be mounted on



Barrel on Trunnions

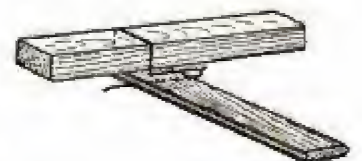
a band and the band bolted at any desired height on the barrel. This would allow the easy dumping of any required quantity of water.

Bending Heavy Brass Braces

Heavy brass angular braces, such as are often used for automobile repair work, can be successfully formed to any desired angle without checking in the bend by using two ordinary monkey wrenches. The jaws of the wrench being smooth permit the metal to slip just enough to avoid breaking. And therefore this method is preferable to a vise.—Contributed by F. B. Mallory, Flemington, N. J.

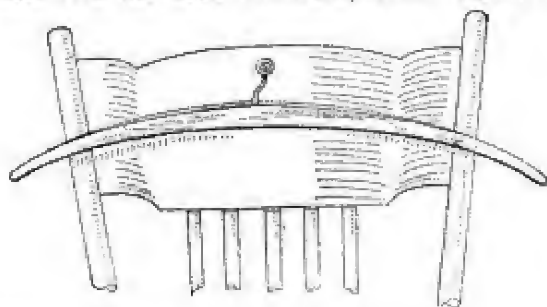
Aid in Nailing on Long Ceiling Boards

When ceiling a porch one day I had some 16-ft. pieces to put on, and as I was alone, I could not hold them while driving the nails. I secured a piece of heavy wire and bent it around a joist, as shown in the sketch, so that it would hold one end of the board while I jointed and nailed the other end. This wire clip did the work of an extra man in holding the boards.—Contributed by Albert J. Weier, Eavons, S. Dak.



Coat Hanger on a Chair

After leaning a few times against my newly pressed coat that had been placed over the back of a chair, I fastened a coat hanger on the chair back as shown in the sketch, and used it to

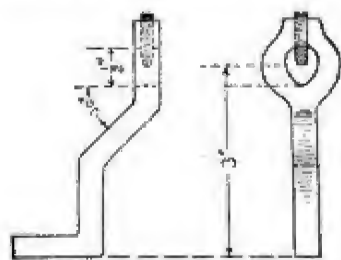


Hanger Attached to Chair Back

hang my coat on while at work. The chair can be used for the purpose it was intended.—Contributed by Victor Labadie, Dallas, Texas.

Lathe Dog for Small Work

The ordinary lathe dog used on small and short pieces is in the way of the tool-post block. To overcome this trouble, bend the tang of the dog at an angle of 30 deg. and use a headless set-screw. The sketch shows the shape of the dog and dimensions.—Contributed by Chas. Hattenberger, Buffalo, New York.



Clip to Keep a Pencil from Rolling

A draftsman usually has several pencils on the drawing board at a time and as these boards incline, it keeps one busy at times grabbing pencils as they roll down the board, says



Clip on Pencil

a correspondent of American Machinist. A piece of belt lacing placed on each pencil as shown in the sketch

will provide an anti-skid device that will keep the pencil where it is placed. The sketch clearly illustrates how the piece of lacing is applied.

Homemade Canvas Belt

Cut a tarpaulin into strips an inch or two wider than the desired belt. Procure some old roller composition that printers use and make it into solution with water and keep it hot. If the solution is too thick, add a little syrup. Cement the cloth strips together with the composition, taking care to put the laps the same way, and make it as many ply as needed for the heft of the belt. Use enough of the cement to firmly cement the strips and when done go over it with a hot flatiron to make sure that all parts are cemented together. Lay the belt straight on the floor and line it to the desired width with a chalkline and trim the edges. If carefully made, the belt will be as good as could be bought, and less expensive.—Contributed by J. S. Van Alstin, Norfolk, Nebraska.

To Keep a Paint Brush Soft

After finishing a job of painting and not desiring to have a can of oil standing around the house, I filled the bristles of the brush with a good supply of paint, carefully wrapped it in paper, tied it securely with a string and placed the brush on a shelf. A short time ago I wished to use the brush and upon unwrapping it I was surprised to find the bristles as soft as when put away. The oil in the paint having soaked the inner wrappings of the paper, thus preserving the brush in first-class shape for two years.—Contributed by F. D. Koon, Schoolcraft, Mich.

☞ Whitewash for outside work is made of $\frac{1}{2}$ bu. slaked lime, 1 lb. salt, $\frac{1}{2}$ lb. sulphite of copper and 1 gal. of sweet milk.

Underground Conduit Construction

The unsightly poles and wiring which have for years marred the appearance of city streets and country highways, as well as constituting a nuisance and source of danger, are gradually disappearing, and the innumerable wires are being laid in underground conduits. Even the smaller towns, proud of the appearance of

age that may be caused by other excavations in the vicinity.

One creosoted-wood duct having an inside diameter of 3 in., or one single-duct clay tile is usually run along on top of the cap as shown in Figs. 2 and 3. These ducts are provided to allow for laterals which may be required from time to time, and which would

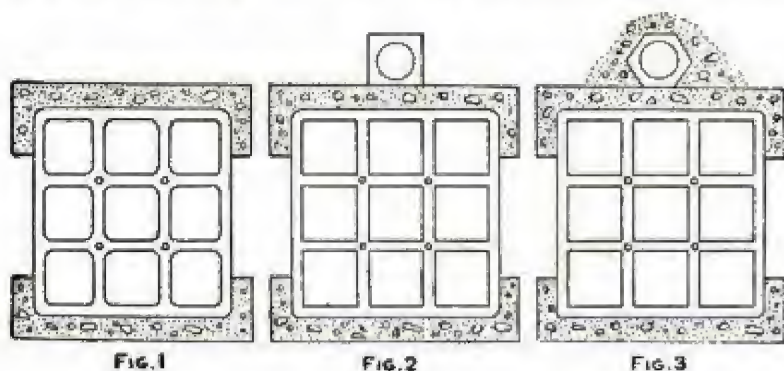


FIG. 1

FIG. 2

FIG. 3

Concrete Bed and Covering

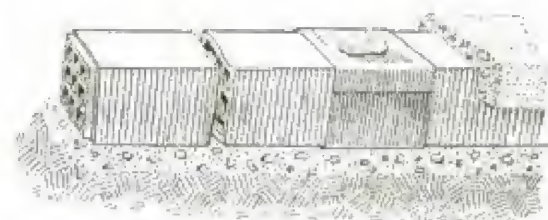


FIG. 4

their main streets, are replacing the poles with conduits.

The present method of construction which has been adopted by the telephone and power companies consists of placing a 4-in. concrete base on which is laid vitrified clay conduit. As the material used in this conduit usually forms a cheap glass in baking, it is absolutely the best material to construct a main conduit or subway. Creosoted-wood ducts and fiber ducts are also used, but do not give as satisfactory results as the tile on heavy runs.

After the concrete bottom is placed the multiple-duct tile is laid, Fig. 1, the joints being made by placing dowel pins in the two top holes. A piece of single-ply tar paper, about 8 in. wide, and long enough to lay on the sides of the tile, is then placed around the joint to exclude dirt, concrete, etc., from the interior of the ducts. The paper is held in place by a dab of mortar as shown in Fig. 4. The clay conduit is then capped with a layer of concrete, 3 in. thick, which projects down the sides of the tile for 3 in. This cap is to protect the conduit and the cables within from dam-

otherwise necessitate excavating from the pole to the manhole. When the creosoted-wood duct or tile is used, the lateral is built from the pole to the single duct which is "tapped." A lateral, or subsidiary, is a term which applies to a one and two-duct run from a manhole or service box to a pole or building and, generally speaking, means a short light subway. The laterals are used to carry the under-

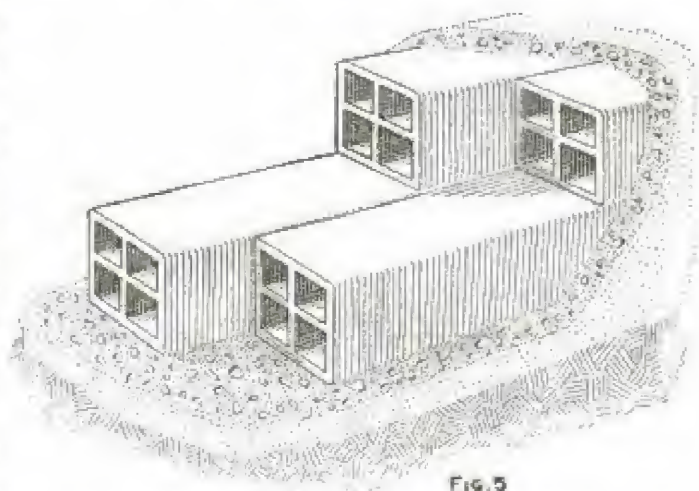


FIG. 5

Four-Tile Unit in a Concrete Casing

ground cables to the poles or buildings above ground, so that the service from the wires can be distributed. The bends shown in the laterals in

Fig. 7 are made of 3-in. iron pipe, which is bent to shape before delivery on the job.

When creosoted wood is used on top of the tile, the joints are simply fitted

placed in the trench and on this the bottom ducts are laid. Concrete is then poured over these ducts and tamped into place. More ducts are laid and concrete tamped in to make

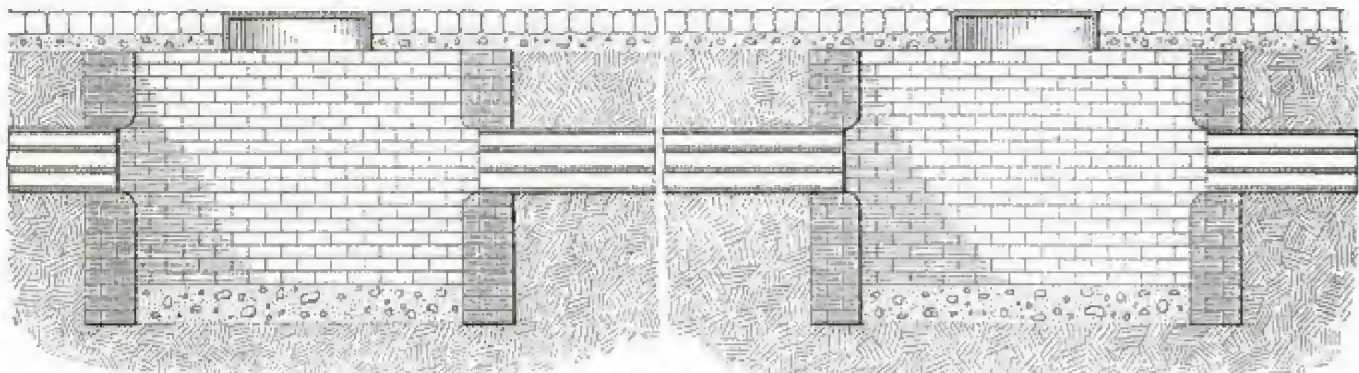


FIG. 5
Manholes

together and the earth replaced. When the single tile is used on top of the main conduit, it must be laid very carefully and covered with concrete.

As the multiple-duct tile is only made in two, three, four, six and nine-hole sizes, it often becomes necessary to build the subway using more than one unit, as shown in Fig. 5. When laid in this manner the joints must be "broken" or "staggered" and the whole run is usually, but not always, encased in a concrete jacket or envelope. When laying two-tile units, one on top of the other, it is customary in first-class work to place from $\frac{1}{4}$ to $\frac{1}{2}$ in. of mortar between the units so that the upper course of tile may be laid straight and true.

it appear as in the cross section, Fig. 8. The lengths of tubes are connected by a slip joint, as shown in Fig. 10. The average length of a fiber duct is about 8 ft.

Another method of building a subway is shown in Fig. 9. When the conduit is built above ground, as is sometimes the case, it is made up of fiber ducts. This method needs no description except to state that a box is built, forms are placed to line up the ducts and the concrete placed the same as in the previous description. The disadvantage of fiber ducts lies in the fact that fiber is not an insulator, as the material of which it is composed consists partly of vegetable matter. The ducts also become soft in warm

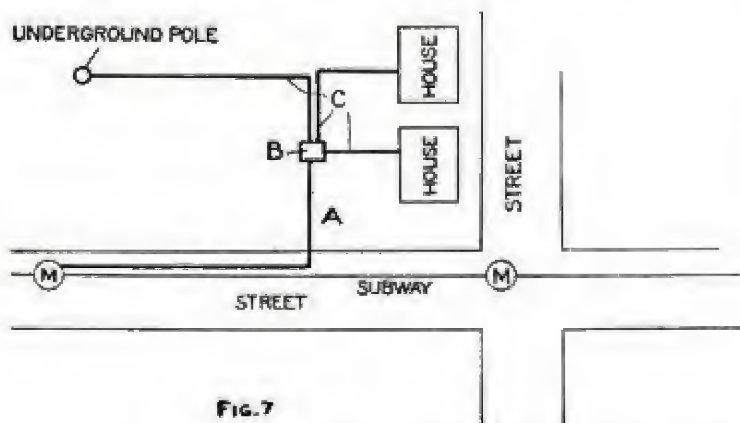


FIG. 7

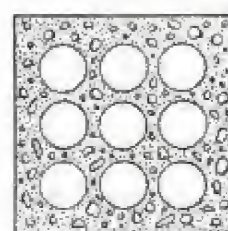


FIG. 8

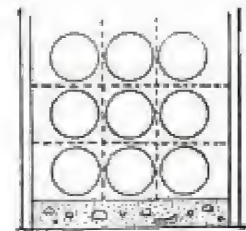


FIG. 9

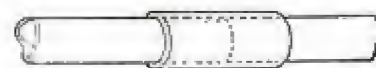


FIG. 10

Plan of Subway and Fiber Ducts Covered with Concrete

When the subway is built of fiber duct instead of vitrified clay, the method of constructing is changed. A bed of concrete, 3 in. deep, is first

weather. Great care must be exercised while placing the concrete.

The manholes used in connection with the conduit run are usually built

of hard-burned common brick laid up in walls 8 in. thick with cement mortar. The floor is usually of concrete, 8 in. thick. The thickness of the walls depends largely on the size, location and earth pressure. A conduit construction with a manhole at each end is shown in Fig. 6. The walls are built up straight and a flat iron manhole frame set on top of them. This style of frame does away with the necessity of placing railroad iron in the walls to form a roof upon which to place the old-style round frames. The standard size for manholes as specified at present is 7 ft. long and 4 ft. wide,

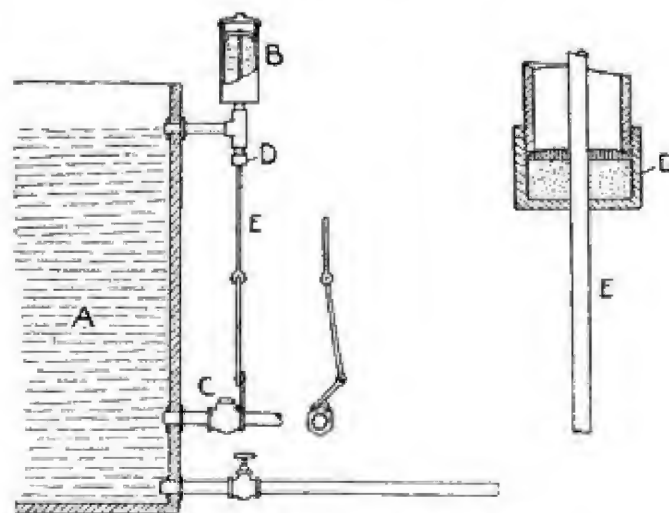
with 5½ ft. depth from floor to top of wall. Service boxes differ from manholes only in size, the length and width being from 3 to 4 ft. and the depth about the same. Service boxes are placed where there is an exceptionally long or crooked lateral, or in special cases, one of which is shown in Fig. 7. This allows for one 150-pair cable, A, to be drawn into the service box B from the manhole, where the three 50-pair cables, C, are spliced into it. The sketch Fig. 7 also shows a method of making up a working drawing of a job of this kind.—Contributed by Geo. M. Petersen, Buffalo, N. Y.

Water-Depth Regulator for a Tank

A tank used for a water supply in connection with a laundry was constructed with a close-fitting cover which would stand a 4-lb. pressure when full. A regulator was attached to the side of the tank A to keep it full all the time without attention. The regulator consisted of an iron pump cylinder, B, such as is used on a hand pump, with a plunger and connecting rod to a quick-acting valve, C, on the inlet pipe. The rod E of the plunger passed through a packing box, D, made on the end of a short piece of pipe. This is shown plainly in the enlarged part of the sketch. The short pipe was fitted with an ordinary pipe cap having a hole drilled in its center a trifle larger than the rod E. A washer was placed over the end of the pipe and packing put into the cap. The check in the pump plunger was closed and blocked to make it air-tight.

The water is admitted through valve C in the inlet pipe, when the valve is in the down position. When the tank is full of water, a portion passes into the pump cylinder and under the pump plunger forcing it up in the position shown and carrying with it the rod that connects the plunger and lever on the valve C, thus raising the lever and closing the valve.

When drawing water through the outlet pipe, a vacuum is caused in the top of the tank and in the cylinder, which draws the plunger down and



Regulator Attached to a Tank

opens the valve. This admits water through the inlet again to fill the tank. The action takes place as soon as the outlet valve is opened. The inflow of water offsets the vacuum, which makes the action of the water entirely free.

If the inlet is as large as the outlet, the water cannot be lowered in the tank. If the inlet is the largest, the valve will open and close like the slow motion of a piston on an engine.—Contributed by C. S. Enright, Cle Elum, Wash.

Taking Care of Leaks through Hinged Windows

Most every hinged window that swings toward the inside leaks when the rain beats against it. There is no

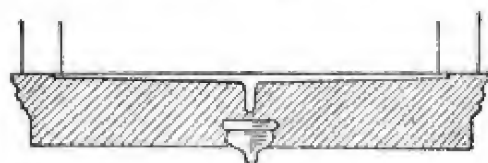


FIG. 1

Cup on Window Sill



FIG. 2

remedy for this as these windows leak even though equipped with the very best weather strips, yet architects are specifying them on new houses quite often.

While abroad I saw an attachment for these windows that interested me very much. It was nothing more than a gutter or groove cut in the window sill, being very shallow at the two extreme ends and gradually getting deeper toward the center. Right at the deepest point a hole was bored about $\frac{1}{4}$ in. in diameter, to which was attached a small pipe as shown in Fig. 1. At the end of this pipe a hook is soldered upon which a can of some ornamental design, Fig. 2, is hung. While this is not a very artistic addition to the window it looks very much better than the sill covered with towels and rags to catch the water, or having the wallpaper beneath the window stained. The device does not remedy the fault, but protects the wall and floor.—Contributed by Gilbert A. Wehr, Baltimore, Md.

Holding a Bolt in a Turning Crank

A bolt and nut may be held in the end of a turning crank or shafting by the following method, which seldom fails, even though it is inclined to work loose. Before inserting the screw place a small block of wood in the hole. When the screw is turned up tightly against the wood, the revolving motion of the machinery will not cause it to work loose.—Contributed by Loren Ward, Stockport, Iowa.

Detector for Polarity of Electric Wires

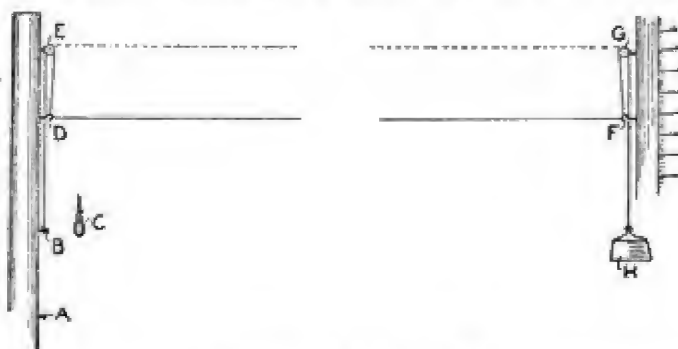
One of the simplest detectors for electrical polarity is white filter paper immersed in a solution of sodium sulphate to which has been added a small quantity of phenol phthalein. The result is a colored paper, which, if moistened, will turn violet when touched with the negative wire, but remains unchanged when in contact with the positive. The paper retains this property indefinitely, and is sensitive to a very feeble current.

Blueprint paper may be used for the same purpose, a white spot developing around the negative pole when the paper is in contact with the wire, while the positive wire has no effect on it.

Adjustable Height Clothesline

The ordinary clothesline is a source of much trouble. To have it low enough for hanging the clothes, to keep them from dragging on the ground and then to prop it up high enough for drying the garments, is invariably a stumbling block to the housekeeper. The sketch shows an easy way to adjust a line which is never slack, never drags the clothes in the dirt, is always high when the clothes are drying and is easily lowered to hang or remove the garments.

Two spikes, A and B, are driven



Clothesline with Weight

into one of the posts and two pulleys, E and G, are fastened at the top of the posts or 7 ft. from the ground. About 5½ ft. above the ground, screw in two screwhooks, D and F. The nails A and B should have a dis-

tance between them equal to the distance D and E.

Make a loop, C, in the end of the line, or tie an iron ring in the line after running it through the pulleys. Loop the end over the spike B and fasten a heavy weight, H, at the other end. Pull the line down and hook it over the hooks D and F. This will give the line the proper height for easily hanging the clothes, and the weight will keep it taut all the time.

Unhook the line at D and at the same time take the loop from the spike B and draw it to A. This action will take up that part of the line from D to E, thus making it possible to utilize all the space between the posts. Release the line from the hook F and the weight will automatically take up the line between F and G, thus keeping it taut all the time without the use of props.—Contributed by Axel C. Hanson, Lincoln, Neb.

Oiling a Lathe Cup Center

An ordinary cup center for a wood lathe can be made with an oil hole so that oil can be applied without re-



Hole for Oil in Cup Center

moving the work. The oil hole is drilled from A to B and then the hole C is drilled to intersect it at right angles. The oil being put in at A runs through the hole and strikes the end of the work at C.—Contributed by Julius Barnes, Columbus, Ga.

Grip for Strap Iron

The article here shown is a little device for erecting pipes or stacks, especially where strap-iron hangers are used, but it will grip wire just as well as strap iron, says a correspondent of Sheet Metal Shop. When putting up hangers, it is difficult to pull the slack out and get them uniform.

With this little device, which is composed of a wedge and link, one can, by the use of a very small set of

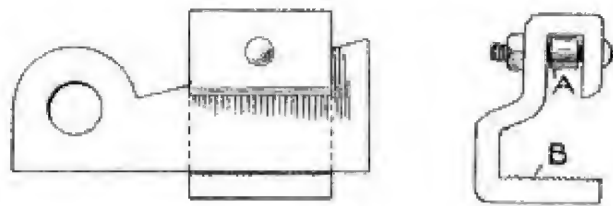


FIG. 1

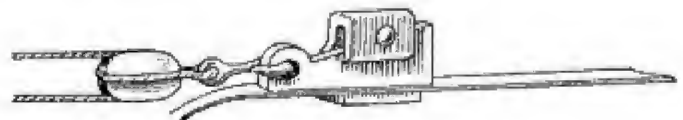


FIG. 2

Grip in the Form of a Wedge

blocks, draw the hanger to the desired tension with perfect ease and without loss of time. The wedge and link can be quickly adjusted.

The side and end views of the wedge and link are shown in Fig. 1. It will be seen that a small roller is placed at A, which allows the wedge to roll freely to its full limit. This roller is made of $\frac{3}{8}$ -in. gas pipe with a $\frac{1}{4}$ -in. bolt and nut to hold it in place. The surface of the link is made rough, as shown at B, causing it to hold while the wedge slips freely on the roller. The link may be made of $\frac{1}{2}$ by $1\frac{1}{4}$ -in. tool steel, but the wedge can be made of any kind of $\frac{1}{2}$ by $1\frac{3}{4}$ -in. iron. In Fig. 2 is a view of the grip in use.

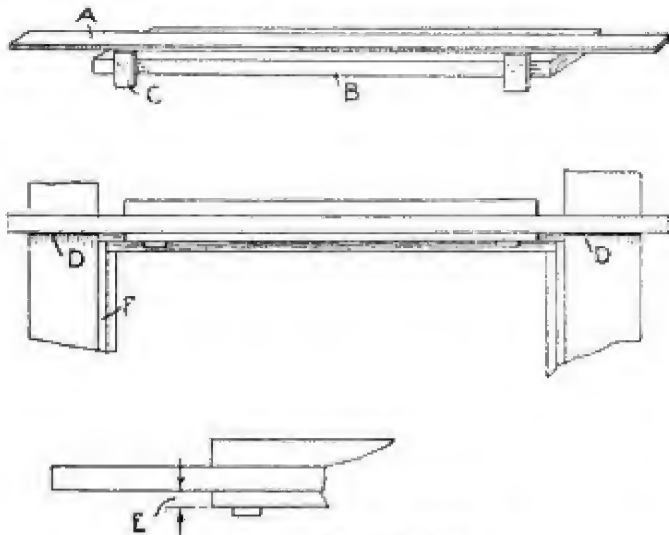
Pointing Brick Walls

When pointing up a crack in the mortar between bricks, it is necessary to cut out the mortar a little longer than the crack and about $\frac{1}{2}$ in. deep. This should be filled with a half-and-half mixture of cement and clean, sharp sand. In replacing cracked or broken bricks, great care should be taken to see that the brick is firmly bedded into the mortar on all sides, or the wall will leak and eventually settle in that particular spot.

Ⓒ Do not forget to oil a machine the first thing in the morning.

A Marker for Door and Window Head Casing

The marker consists of four pieces put together as shown in the perspective sketch. The pieces can be of any convenient material and size, but the relative sizes shown in the sketch will be found most practical. In this case



Marking Door Casing

A is a piece of window stop, $\frac{3}{8}$ by $\frac{3}{4}$ in., fastened to a piece, B, $\frac{3}{4}$ by 3 in. The pieces C are cut $1\frac{1}{4}$ in. long from window stop. The length of the tool will depend on the size of the doors and windows.

The pieces C are placed flush against the outside groove of the door frame. If the distance E corresponds to the thickness F, a pencil drawn

along the edge D makes a mark which is true with the frame of the door. The head casing can be placed on the ends of the side casing cut to the marks and nailed without fear of a crack showing.

In the case of a window head where the frame is made of different material, the piece A is placed flush with B. This tool is particularly applicable to carpenters whose door and window frames do not always fit true in door and window openings.—Contributed by Jo Sorensen, Portland, Ore.

Fitting Screws in Old Holes

When window or door screens are removed for the winter, and it is intended to hang them again in the spring, paint the holes where the screws were removed from the wood with a small brush or a piece of cloth. When the screens are replaced the next season the screws will not be loose but will hold as firmly as when the holes were first made.—Contributed by John T. Timmons, Cadiz, Ohio.

¶ If one bolt is lost on a planetary transmission, the overweight on the others is apt to shear them off.

Lemon Squeezer

As we were very much in need of a lemon squeezer one day and did not have one in the house, I soon made a substitute that gave better results

was 3 in. wide and 7 in. long. A 2-in. circle was drawn on the paddle part and eight 6-penny nails were driven part way in on the line, in a slanting position (Fig. 2), so that the heads formed a circle about 1 in. in diameter.



Fig. 1



Fig. 2



Fig. 3

Nails in a Board Take the Place of a Squeezer

than an ordinary squeezer. I made a handle of soft pine in the shape of a paddle (Fig. 1) from the wood of an old packing-box end. The handle

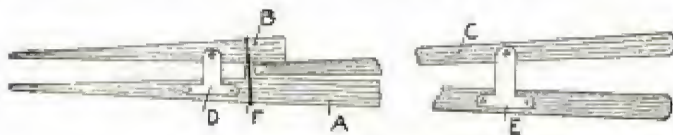
with the nails in the positions shown in Fig. 3, and one-half the lemon is pushed onto the nails and turned. The squeezer can be used a great

many times as it is easily cleaned.—Contributed by W. A. Lane, El Paso, Texas.

A Show-Window Stick

A stick, as shown in the sketch, that will prove quite useful to the window dresser, can be made in a short time and used to place small articles in a window without getting inside. The stick is made of three pieces of white pine, $\frac{1}{2}$ in. thick, $\frac{3}{4}$ in. wide and in the following lengths: First, 36 in.; second, 31 in., and the third, $4\frac{3}{4}$ in. long. The longest piece, A, is first tapered from one end to the other; the next longest piece, C, is tapered to $\frac{1}{4}$ in., and the short piece, B, is tapered the same as A on the end.

The pieces are fastened together with inverted T-shaped pieces of



Stick Operates Like Pliers

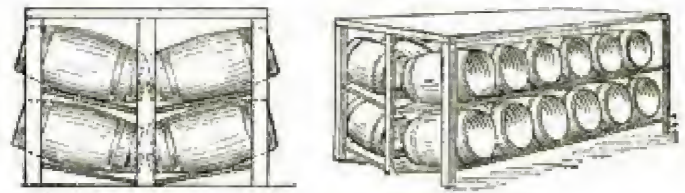
sheet brass, D and E, placed on each side in the positions shown. The shorter one is $1\frac{3}{8}$ in. high and the other is $1\frac{3}{4}$ in. A large rubber band, F, serves as a spring to keep the points separated. The stick is operated the same as a pair of pliers.—Contributed by W. J. Faulkner, Russellville, Ark.

Nail Kegs Used as Bins

Large hardware stores do not require bins as receptacles for nails. The loose stock of nails should not be kept on the salesroom floor except those sold in 1-lb. boxes, says Hardware Reporter. A large stock of nails can be kept in the basement and orders filled from the original kegs, which can be arranged in rows underneath the counter or table.

The kegs can be arranged so they will incline outwardly on a plank shelf, the upper part of which is sheathed with angle iron to guard against wear. The bottoms can rest

upon another plank of less width, securely fastened at right angles to the shelf and elevated from the floor sufficiently to render the contents of the



Kegs in a Table

kegs accessible without the necessity of much stooping.

The kegs should be arranged in order according to the size of the nails they contain, and as each one is emptied of its contents, it is removed and another keg full of the same size nails put in its place. The sketch shows the ingenuity of the plan, in which each keg serves as a bin for its contents, and does not permit of the accumulation of dust as does the average nail bin. It also affords more advantageous use of valuable space on the first floor of the store.

How to Make a Small Jack

Small jacks are useful tools in any shop or garage. The shop that is not provided with these tools in sufficient numbers can

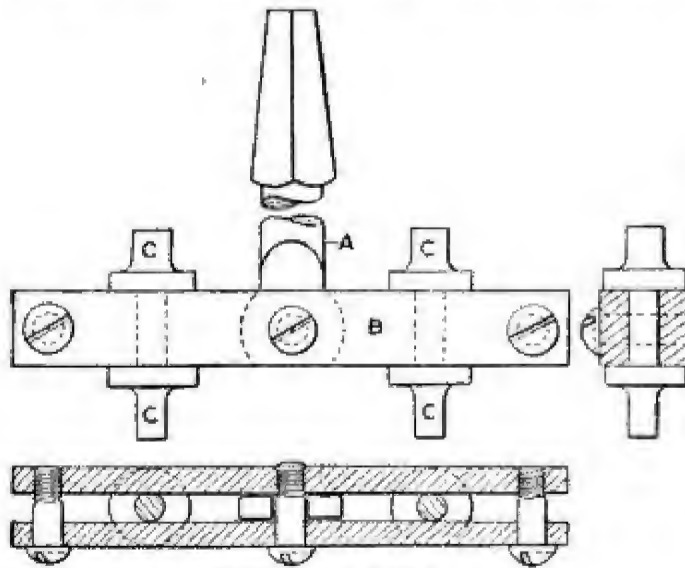
have its workmen make them in spare time from scrap material. The sketch shows a jack the body part of which is made of a bolt with a hexagon



head. The head is turned off to make a flat surface and a hole is drilled through its center and tapped the full length. The screw is a part of an old or broken clamp having a swivel head, which is very handy for adjusting itself to slanting surfaces. Any size or length can be made to suit the individual needs.—Contributed by Donald A. Hampson, Middletown, N. Y.

A Spanner Wrench

A tool for use in connection with an ordinary brace for grinding in valves of gas and gasoline engines is the in-

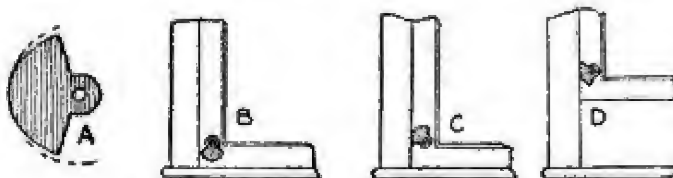


Spanner for a Brace

vention of a correspondent of American Machinist. The shank A is of any desired length. One end of it is squared as shown, while the other end is pivoted in the swinging yoke B which carries the adjustable driving-pins C. These driving-pins enter the holes usually provided in gasoline-engine valves for the purpose of grinding them in their seats.

Window Lock

A simple and effective lock which will hold the window in any position is shown in the sketch. It is attached to the window sash by means of a screw and is placed just far enough



Lock Attached to Window Sash

away from the window casing so that the edges of the outside circle will engage firmly against it, but will not allow the catch to pass the center. The outside edge is not an arc of a circle but is cut as shown at A. In the illustration, B represents the catch attached to the sash; C, in position to

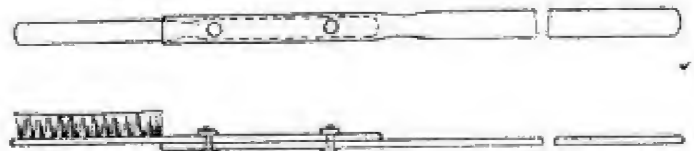
lock the closed sash, and D holds the window open at any point.—Contributed by Geo. M. Harrier, Lockport, New York.

Attaching a Lathe Dog on Threads

In shop practice it is often necessary to apply the dog to the threaded ends of bolts and studs. Where no threaded dogs are provided, the following method can be used to advantage: Take an ordinary nut, having the correct number of threads, and saw it centrally in halves. Place one half of the nut in the bottom of the dog and the other half on top. Insert the bolt or threads of the work between the two halves and tighten with the set-screw.—Contributed by J. B. Shiver, Rock Hill, S. C.

Brush for Cleaning Commutators

In the accompanying illustration is shown a little tool which comes in very handy for cleaning dirt, carbon and copper dust from commutators and brush holders, says Building

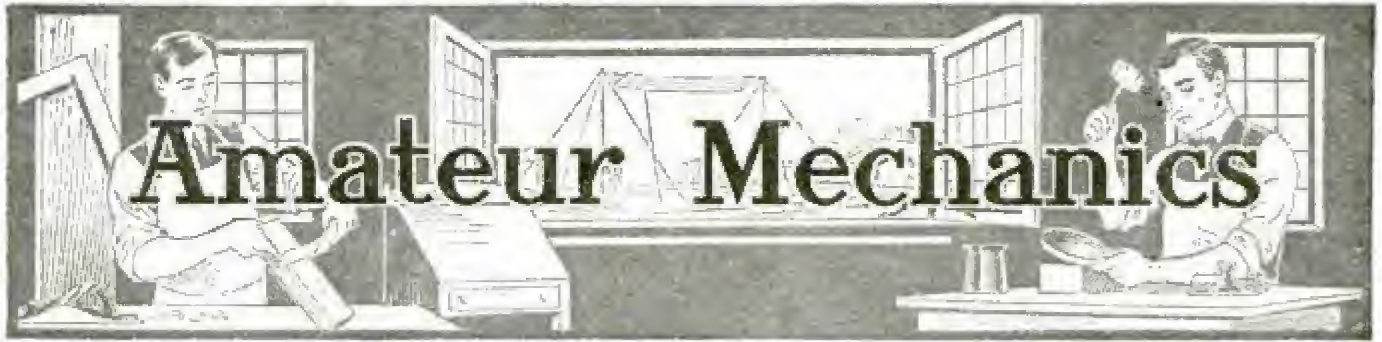


Toothbrush Fastened on Long Handle

Management. It is made by fitting a good stiff toothbrush with a long handle, as shown in the sketch. When the bristles of the brush become worn, the brush may be taken off and the handle fitted with another. This brush is also handy for cleaning the parts of circuit-breakers and other switchboard appliances.

Finishing a Hammer Handle

To put a fine working finish on a hammer handle rub in a filler consisting of a thin paste made by mixing plaster of Paris and linseed oil. This prevents the hammer from soaking up oil, and at the same time insures a good hand grip.



A Model Steam Engine

The accompanying sketch illustrates a two-cylinder single-acting, poppet-valve steam engine of home construction.

The entire engine, excepting the flywheel, shaft, valve cams, pistons and bracing rods connecting the upper and lower plates of the frame proper, is of brass, the other parts named being of cast iron and bar steel.

The cylinders, G, are of seamless brass tubing, $1\frac{1}{2}$ in. outside diameter; the pistons, H, are ordinary 1-in. pipe caps turned to a plug fit, and ground into the cylinders with oil and emery. This operation also finishes the inside of the cylinders.

The upright rods binding the top and bottom plates are of steel rod about $\frac{1}{8}$ -in. in diameter, threaded into the top plate and passing through holes in the bottom plate with hexagonal brass nuts beneath.

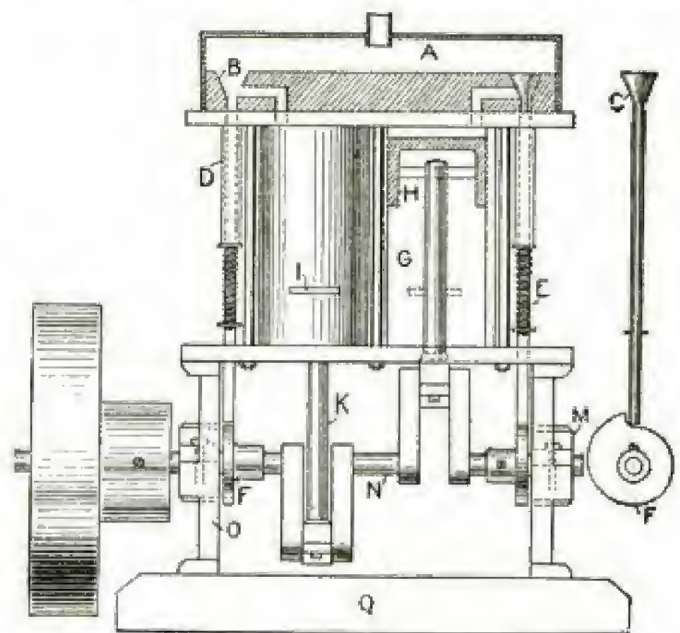
The valves, C, and their seats, B, bored with a countersink bit, are plainly shown. The valves were made by threading a copper washer, $\frac{3}{8}$ in. in diameter, and screwing it on the end of the valve rod, then wiping on roughly a tapered mass of solder and grinding it into the seats B with emery and oil.

The valve rods operate in guides, D, made of $\frac{1}{4}$ -in. brass tubing, which passes through the top plate and into the heavy brass bar containing the valve seats and steam passages at the top, into which they are plug-fitted and soldered.

The location and arrangement of the valve seats and steam passages are shown in the sketch, the flat bar

containing them being soldered to the top plate.

The steam chest, A, over the valve mechanism is constructed of 1-in.



Engine Details

square brass tubing, one side being sawed out and the open ends fitted with pieces of $\frac{1}{16}$ -in. sheet brass and soldered in. The steam inlet is a gasoline pipe connection such as used on automobiles.

The valve-operating cams, F, are made of the metal ends of an old typewriter platen, one being finished to shape and then firmly fastened face to face to the other, and used as a pattern in filing the other to shape. Attachment to the shaft, N, is by means of setscrews which pass through the sleeves.

The main bearings, M, on the supports, O, and the crank-end bearings of the connecting rods, K, are split and held in position by machine

screws with provision for taking them up when worn.

The exhausting of spent steam is accomplished by means of slots, I, sawed into the fronts of the cylinders at about $\frac{1}{8}$ in. above the lowest position of the piston's top at the end of the stroke, at which position of the piston the valve rod drops into the cut-out portion of the cam and allows the valve to seat.

All the work on this engine, save turning the pistons, which was done

in a machine shop for a small sum, and making the flywheel, this being taken from an old dismantled model, was accomplished with a hacksaw, bench drill, carborundum wheel, files, taps and dies. The base, Q, is made of a heavy piece of brass.

The action is smooth and the speed high. Steam is supplied by a sheet-brass boiler of about 3 pt. capacity, heated with a Bunsen burner.—Contributed by Harry F. Lowe, Washington, D. C.

Magic Spirit Hand

The magic hand made of wax is given to the audience for examination, also a board which is suspended by four pieces of common picture-frame wire. The hand is placed upon the board and answers, by rapping, any question asked by members of the audience. The hand and the board may be examined at any time and yet the rapping can be continued, though surrounded by the audience.

The Magic Wand, London, gives the secret of this spirit hand as follows: The hand is prepared by concealing in the wrist a few soft iron plates, the wrist being afterwards bound with black velvet as shown in Fig. 1. The board is hollow, the top being made of thin veneer (Fig. 2). A small magnet, A, is connected to a small flat pocket lamp battery, B. The board is suspended by four lengths of picture-frame wire one of which, E, is

a connecting plug at the top. The plug can be taken out or put in as desired.

The top of the board must be made to open or slide off so that when the battery is exhausted a new one can be installed. Everything must be firmly fixed to the board and the hollow space filled in with wax, which will make the board sound solid when tapped.

In presenting the trick, the performer gives the hand and board with wires and switch for examination, keeping the plug concealed in his right hand. When receiving the board back, the plug is secretly pushed into the switch, which is held in the right hand. The hand is then placed on the board over the magnet. When the performer wishes the hand to move he pushes the plug in, which turns on the current and causes the magnet to attract the iron in the wrist, and will,



FIG. 1

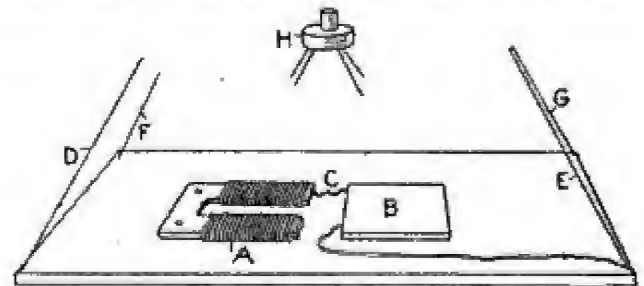


FIG. 2

Wax Hand on Board and Electrical Connections

connected to the battery and another, D, to the magnet. The other wires, F and G, are only holding wires. All the wires are fastened to a small ornamental switch, H, which is fitted with

therefore, make the hand rap. The switch can be made similar to an ordinary push button so the rapping may be easily controlled without detection by the audience.

Equilibrator for Model Aeroplanes

On one of my model aeroplanes I placed an equilibrator to keep it balanced. The device was attached to a crosspiece fastened just below the

at the lower end and two lines connecting the ends of the planes at the upper end. These are shown in Fig. 1. When the aeroplane tips, as

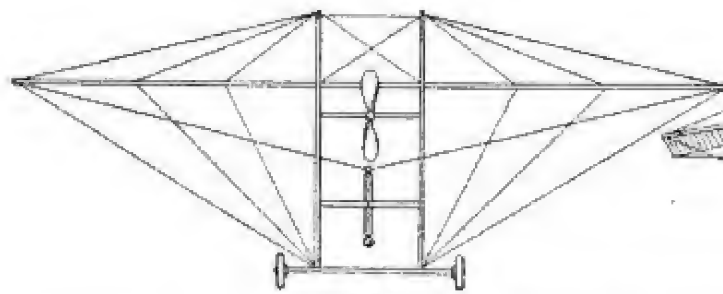


FIG. 1

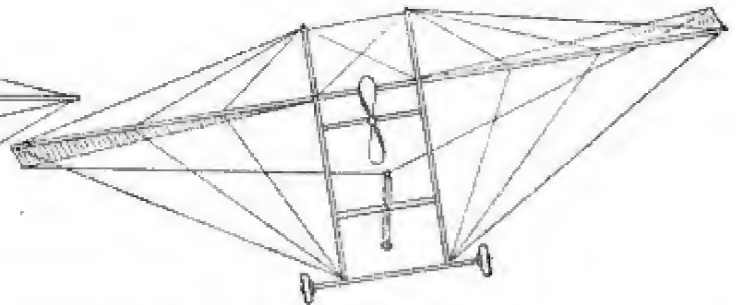


FIG. 2

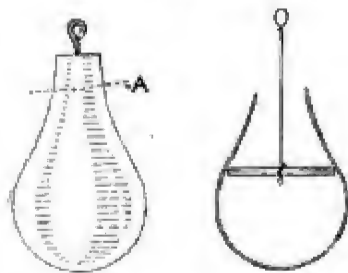
Warping the Aeroplane Wings

propeller between the main frame uprights. A stick was made to swing on a bolt in the center of the crosspiece to which was attached a weight

shown in Fig. 2, the weight draws the lines to warp the plane so it will right itself automatically.—Contributed by Louis J. Day, Floral Park, N. Y.

Repairing Christmas-Tree Decorations

Small glass ornaments for Christmas-tree decoration are very easily broken on the line shown in the sketch. These can be easily repaired by inserting in



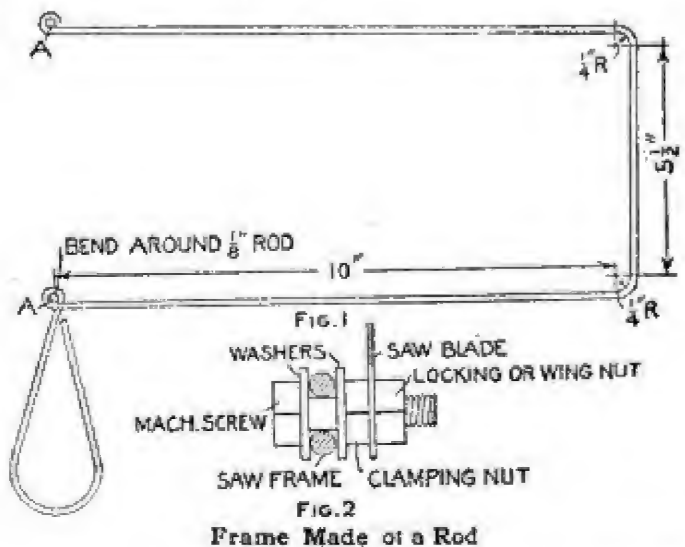
the neck a piece of match, toothpick or splinter of wood and tying the hanging string to it.

Homemade Scroll Saw

A scroll saw, if once used, becomes indispensable in any home carpenter chest, yet it is safe to say that not one in ten contains it. A scroll saw is much more useful than a keyhole saw for sawing small and irregular holes, and many fancy knick-knacks, such as brackets, bookracks and shelves can be made with one.

A simple yet serviceable scroll saw frame can be made from a piece of cold-rolled steel rod, $\frac{3}{32}$ or $\frac{1}{4}$ in. in diameter, two $\frac{1}{8}$ -in. machine screws, four washers and four square nuts.

The rod should be 36 or 38 in. long, bent as shown in Fig. 1. Place one washer on each screw and put the screws through the eyelets, A A, then place other washers on and fasten in place by screwing one nut on each screw, clamping the washers against the frame as tightly as possible. The saw, which can be purchased at a local hardware store, is fastened between the clamping nut and another nut as shown in Fig. 2.



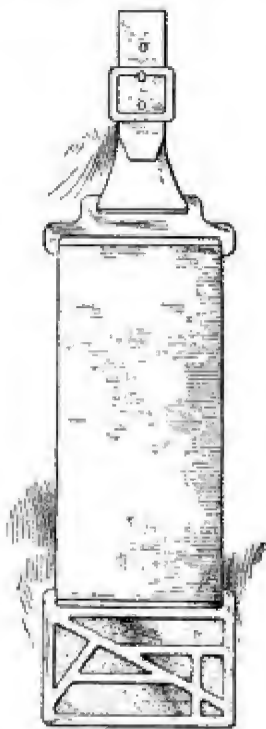
Frame Made of a Rod

If two wing nuts having the same number and size of threads are available, use them in place of the outside nuts. They are easier to turn when

inserting a saw blade in a hole or when removing broken blades.—Contributed by W. A. Scranton, Detroit, Michigan.

How to Make a Watch Fob

The fixtures for the watch fob shown—half size—may be made of either brass, copper, or silver. Silver is the most desirable but, of course, the most expensive. The buckle is to be purchased. The connection is to be of leather of a color to harmonize with that of the fixtures. The body of the fob may be of leather of suitable color or of silk. Of the leathers, green and browns are the most popular, though almost any color may be obtained.



Make full size drawings of the outline and design of the fixtures. With carbon paper trace these on the metal. Pierce the metal of the parts that are to be removed with a small hand drill to make a place for the leather or silk. With a small metal saw cut out these parts and smooth up the edges, rounding them slightly so they will not cut the leather or silk. Next cut out the outlines with the metal shears. File these edges, rounding and smoothing with emery paper. The best way of handling the decorative design is to etch it and, if copper or brass, treat it with color.

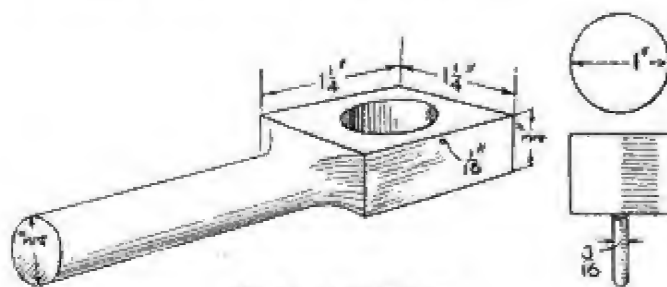
For etching, first cover the metal with black asphaltum varnish, on the back and all the parts that are not to be touched with the acid. In the design shown, the unshaded parts should not be etched and should, therefore, be covered the same as the back. Apply two coats, allowing each time to dry, after which immerse the metal in a

solution prepared as follows: 3 parts water, 1 part nitric acid, 1 part sulphuric acid. Allow the metal to remain in this until the acid has eaten to a depth of $\frac{1}{32}$ in., then remove it and clean in a turpentine bath, using a swab and an old stiff brush. The amount of time required to do the etching will depend upon the strength of the liquid, as well as the depth of etching desired.

For coloring silver, as well as brass and copper, cover the metal with a solution of the following: $\frac{1}{2}$ pt. of water in which dissolve, after breaking up, five cents' worth of sulphureted potassium. Put a teaspoonful of this into a tin with 2 qt. of water. Polish a piece of scrap metal and dip it in the solution. If it colors the metal red, it has the correct strength. Drying will cause this to change to purple. Rub off the highlights, leaving them the natural color of the metal and apply a coat of banana-oil lacquer.

An Austrian Top

All parts of the top are of wood and they are simple to make. The handle is a piece of pine, $5\frac{1}{4}$ in. long, $1\frac{1}{4}$ in. wide and $\frac{3}{4}$ in. thick. A handle, $\frac{3}{4}$ in. in diameter, is formed on one end, allowing only $1\frac{1}{4}$ in. of the other end to remain rectangular in shape. Bore a $\frac{3}{4}$ -in. hole in this end for the top. A $\frac{1}{16}$ -in. hole is bored in the edge to enter the large hole as shown. The top can be cut from a broom handle or a round stick of hardwood.



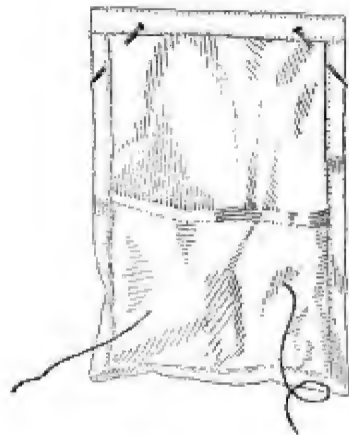
Parts of the Top

To spin the top, take a piece of stout cord about 2 ft. long, pass one end through the $\frac{1}{16}$ -in. hole and wind it on the small part of the top in the usual way, starting at the bottom and

winding upward. When the shank is covered, set the top in the $\frac{3}{4}$ -in. hole. Take hold of the handle with the left hand and the end of the cord with the right hand, give a good quick pull on the cord and the top will jump clear of the handle and spin vigorously.—Contributed by J. F. Tholl, Ypsilanti, Michigan.

Pockets for Spools of Thread

A detachable pocket for holding thread when sewing is shown herewith. The dimensions may be varied to admit any number or size of spools. Each pocket is made to take a certain size spool, the end of the thread being run through the cloth front for



obtaining the length for threading a needle. This will keep the thread from becoming tangled and enable it always to be readily drawn out to the required length.—Contributed by Miss L. Alberta Norrell, Augusta, Ga.

Cleaning Leather on Furniture

Beat up the whites of three eggs carefully and use a piece of flannel to rub it well into the leather which will become clean and lustrous. For black leathers, some lampblack may be added and the mixture applied in the same way.

A Baking Pan

When making cookies, tarts or similar pastry, the housewife often wishes for something by which to lift the baked articles from the pan. The baking tray or pan shown in the sketch not only protects the hands from burns but allows the baked articles easily to slip from its surface. The pan is made from a piece of sheet iron slightly

larger than the baking space desired. Each end of the metal is cut so that a part may be turned up and into a roll to make handles for the pan.



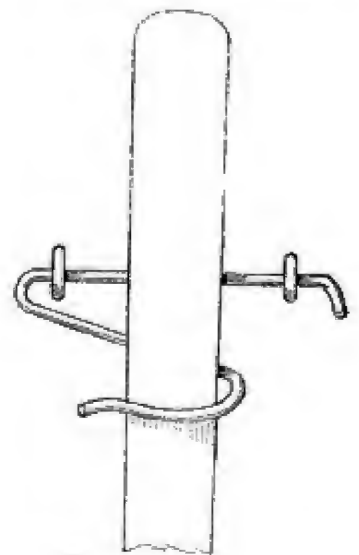
Baking Pan without Sides

A wire or small rod is placed between the handles as shown. This wire is fastened at each end and a loop made in the center. The pan can be removed from the oven by placing a stick through the loop and lifting it out without placing the hands inside the hot oven. The baking surface, having no sides, permits the baked articles to be slid off at each side with a knife or fork.—A. A. Houghton, Northville, Mich.

A Broom Holder

A very simple and effective device for holding a broom when it is not in use is shown in

the sketch. It is made of heavy wire and fastened to the wall with two screweyes, the eyes forming bearings for the wire. The small turn on the end of the straight part is to hold the hook out far enough from the wall to



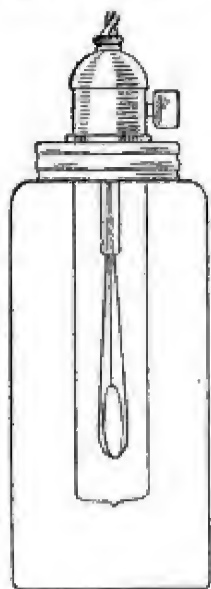
make it easy to place the broom in the hook. The weight of the broom keeps it in position.—Contributed by Irl Hicks, Centralia, Mo.

CA string for drawing electric wires into bent fixtures can be easily inserted by rolling it into a small ball and blowing it through while holding one end.

A Darkroom Lantern

Procure an ordinary 2-qt. glass fruit jar, break out the porcelain lining in the cover and cut a hole through the metal, just large enough to fit over the socket of an incandescent electric globe, then solder cover and socket together, says Studio Light. Line the inside of the jar with two thicknesses of good orange post-office paper. The best lamp for the purpose is an 8-candlepower showcase lamp, the same as shown in the illustration. Screw the lamp into the socket and screw the cover onto the jar, and you have a safe light of excellent illuminating power.

When you desire to work by white light, two turns will remove the jar.



If developing papers are being worked, obtain a second jar and line with light orange paper, screw into the cover fastened to the lamp and you have a safe and pleasant light for loading and development. By attaching sufficient cord to the lamp, it can be moved to any part of the darkroom, and you have three lamps at a trifling cost.

Preventing Vegetables from Burning in a Pot

Many housekeepers do not know that there is a simple way to prevent potatoes from burning and sticking to the bottom of the pot. An inverted pie pan placed in the bottom of the pot avoids scorching potatoes. The water and empty space beneath the pan saves the potatoes. This also makes the work of cleaning pots easier as no adhering parts of potatoes are left to be scoured out.

A Clothes Rack

A clothes-drying rack that has many good features can be made as shown in the illustration. When the rack is

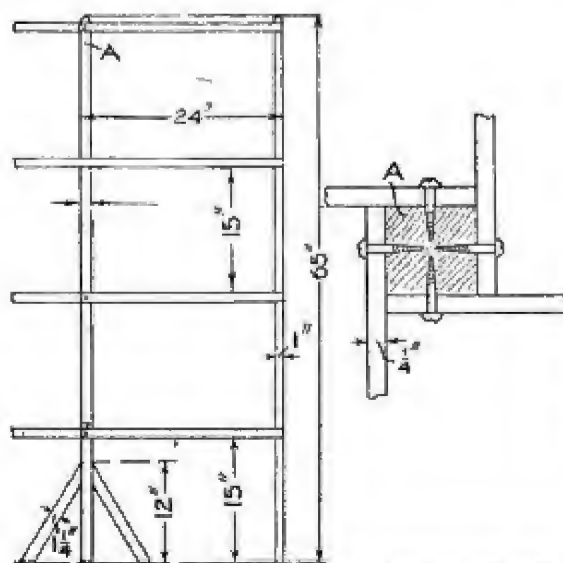
be made of any hard wood and the material list is as follows:

- 1 Center post, 1 1/4 in. square by 62 in.
- 4 Braces, 1 1/4 in. square by 12 in.
- 16 Horizontal bars, 1 by 1 1/4 by 24 in.
- 4 Vertical pieces, 3/4 by 1 by 65 in.

Attach the four braces for the feet with finishing nails after applying a good coat of glue.

The horizontal bars are fastened to the vertical pieces with rivets using washers on both sides. The holes are bored a little large so as to make a slightly loose joint. The other ends of the bars are fastened to the center post with roundhead

screws. They are fastened, as shown in the cross-section sketch, so it can be folded up.—Contributed by Herman Fosel, Janesville, Wis.



Folding Clothes Rack

closed it will fit into a very small space and one or more wings can be used at a time as the occasion or space permits, and not tip over. The rack can

How to Make Corner Pieces for a Blotter Pad

To protect the corners of blotting pads such as will be found on almost every writing desk, proceed as follows:

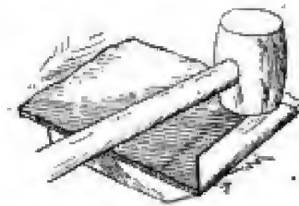
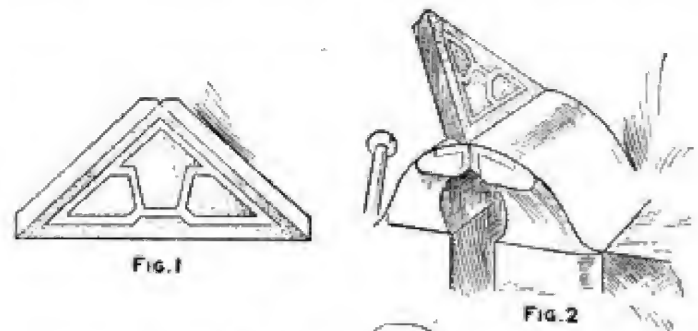
First, make a design of a size proportionate to the size of the pad and make a right-angled triangle, as shown in Fig. 1, on drawing paper. Leave a small margin all around the edge and then place some decorative form therein. Make allowance for flaps on two sides, as shown, which may later be turned back and folded under when the metal is worked. It should be noted that the corners of the design are to be clipped slightly. Also note the slight overrun at the top with the resulting V-shaped indentation.

To make a design similar to the one shown, draw one-half of it, then fold along the center line and rub the back of the paper with a knife handle or some other hard, smooth surface, and the other half of the design will be traced on the second side. With the metal shears, cut out four pieces of copper or brass of No. 22 gauge and with carbon paper trace the shape and decorative design on the metal. Then cut out the outline and file the edges smooth.

Cover the metal over with two coats of black asphaltum varnish, allowing each coat time to dry. Cover the back and all the face except the white background. Immerse in a solution of 3 parts water, 1 part nitric acid and 1 part sulphuric acid. When the metal has been etched to the desired depth, about 1-32 of an inch, remove it and clean off the asphaltum with turpentine. Use a stick with a rag tied on the end for this purpose so as to keep the solution off the hands and clothes. The four pieces should be worked at the same time, one for each corner.

It remains to bend the flaps. Place the piece in a vise, as shown in Fig. 2, and bend the flap sharply to a right angle. Next place a piece of metal of a thickness equal to that of the blotter pad at the bend and with the mallet bring the flap down parallel to the face

of the corner piece, Fig. 3. If the measuring has been done properly, the flaps ought to meet snugly at the corner. If they do not, it may be neces-



Manner of Forming the Plates

sary to bend them back and either remove some metal with the shears or to work the metal over farther. All the edges should be left smooth, a metal file and emery paper being used for this purpose.

If a touch of color is desired, it may be had by filling the etched parts with enamel tinted by the addition of oil colors, such as are used for enameling bathtubs. After this has dried, smooth it off with pumice stone and water. To keep the metal from tarnishing, cover it with banana-oil lacquer.

Boring Holes in Cork

The following hints will be found useful when boring holes in cork. In boring through rubber corks, a little household ammonia applied to the bit enables one to make a much smoother hole and one that is nearly the same size at both openings. The common cork, if rolled under the shoe sole, can be punctured easily and a hole can be bored straighter. The boring is made easier by boiling the cork, and this operation insures a hole that will be the desired size and remain the size of the punch or bit used.

Pot-Cover Closet

The sides of the cover closet are cut as shown in Fig. 1 and shelves are nailed between them at a slight angle.



Fig. 1

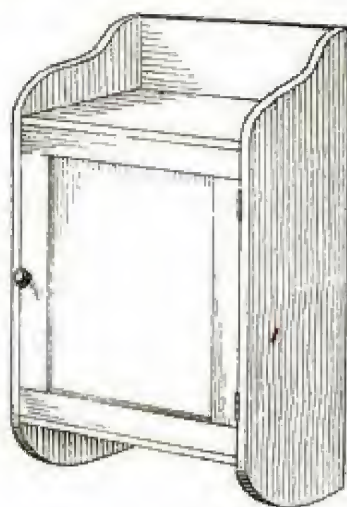


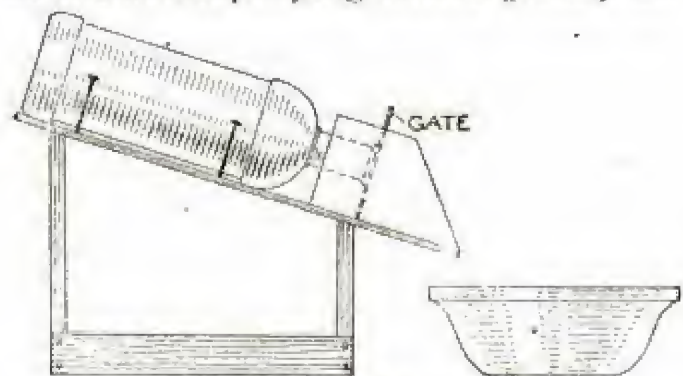
Fig. 2

Closet for Holding Pot Covers

No dimensions are given as the space and the sizes of the covers are not always the same. The back is covered with thin boards placed vertically. The front can be covered with a curtain or a paneled door as shown.—Contributed by Gilbert A. Wehr, Baltimore, Md.

Aid in Mixing Salad Dressing

Some cooks find it a very difficult matter to prepare salad dressing, principally mayonnaise dressing, as the constant stirring and pouring of oil and liquids are required in the operation. The simple homemade device shown in the accompanying sketch greatly as-



Bottle in Stand

sists in this work. It consists of a stand to hold a bottle, the mouth of which rests against a small gate directly in the rear of the attached tin trough. The weight of the bottle and

the contents against the gate serves as a check or stopper. If the gate is raised slightly, it will permit a continuous flow of liquid of the desired amount.

Saving Overexposed Developing Prints

In using developing papers, either for contact printing or enlargements, you are, by all rules of the game, entitled to a certain number of overexposed prints, says a correspondent of Camera Craft. But there is no reason why you should lose either the paper or the time and trouble expended in making these prints. By using the following method, you can turn these very dark prints into good ones.

First: these overexposed prints must be fully developed. Do not try to save them by rushing them out of the developer into the short-stop or fixing bath. The results will be poor, and, if you try to tone them afterward, the color will be an undesirable, sickly one. Develop them into strong prints, thoroughly fix, and wash until you are sure all hypo is removed. In my own practice, I carry out this part of the work thoroughly, then dry the prints and lay aside these dark ones until there is an accumulation of a dozen or more, doing this to avoid too frequent use of the very poisonous bleaching solution. The bleacher is made up as follows and should be plainly marked "Poison."

Cyanide of potassium.....	2 oz.
Iodide of potassium.....	20 gr.
Water.....	16 oz.

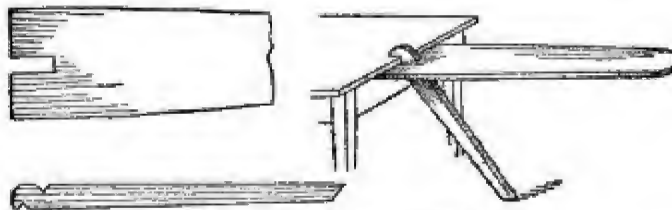
Place the dry print, without previous wetting, in this solution. It will bleach slowly and evenly, but, when it starts to bleach, transfer it to a tray of water, where it will continue to bleach. When the desired reduction has taken place, stop the action at once by immersing the print in a 10-per-cent solution of borax. The prints may be allowed to remain in this last solution until they are finished. A good final washing completes the process. This washing must be thorough and a

sponge or a tuft of cotton used to clean the surface of the print.

With a little practice, this method of saving prints that are too dark becomes easy and certain. The prints are lightened and at the same time improved in tone, being made blue-black with a delicate and pleasing quality that will tempt you to purposely over-expose some of your prints in order to tone them by this method for certain effects. The process is particularly valuable to the worker in large sizes, as it provides a means of making quite a saving of paper that would otherwise be thrown away.

An Ironing-Board Stand

An ordinary ironing board is cut square on the large end and a slot cut $1\frac{1}{2}$ in. wide and 4 in. long to admit the angle support. The support is placed against the table and the board



Stand Attached to Table

is pressed down against the outer notch which jams against the table, thus holding the board rigid and in such a position as to give free access for ironing dresses, etc.—Contributed by T. L. Gray, San Francisco, Cal.

A Desk Blotting Pad

Procure four sheets of blotting paper, preferably the colored kind, as it will appear clean much longer than the white. The size of the pad depends on the size of the blotting paper.

Fold four pieces of ordinary wrapping paper, 5 by 15 in. in size, three times, to make it 5 by 5 in. Fold each one from corner to corner as shown in Fig. 1 and again as in Fig. 2. Paste the last fold together and the corner holders are complete. Put one on each corner of the blotting paper. They

can be fastened with a small brass paper fastener put through the top of the holder. The blotting paper can

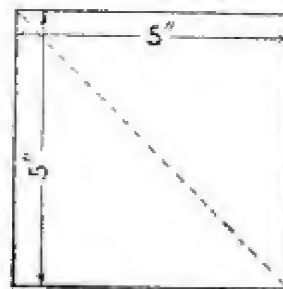


FIG. 1

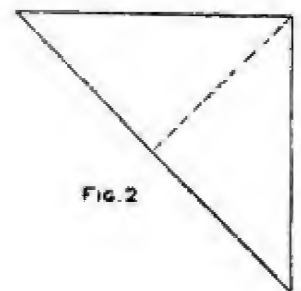


FIG. 2

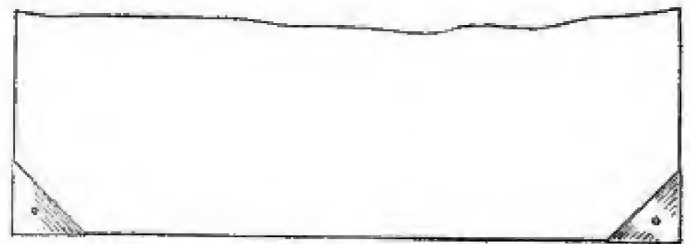


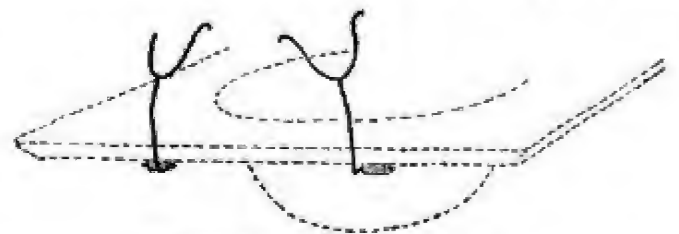
FIG. 3

Paper Corners for Blotter Pads

be easily changed by removing the holders and fasteners. Corners complete are shown in Fig. 3.—Contributed by J. Wilson Aldred, Toronto, Canada.

Sleeve Holders for Lavatories

A very handy article is an attachment on wash basins or lavatories for holding the sleeves back while washing the hands. It is very annoying to have the sleeves continually slip down and become wet or soiled. The simple device shown herewith can be made with bent wires or hooks and attached in such a way that it can be dropped out



Wires Attached to a Lavatory

of the way when not in use.—Contributed by L. J. Monahan, Oshkosh, Wisconsin.

CA pencil eraser will remove the tarnish from nickel plate, and the ink eraser will remove the rust from drawing instruments.

How to Make a Brass Bookmark

Secure a piece of brass of No. 20 gauge, having a width of $2\frac{1}{4}$ in. and a length of 5 in. Make a design similar to that shown, the head of which is 2 in. wide, the shaft 1 in. wide below the

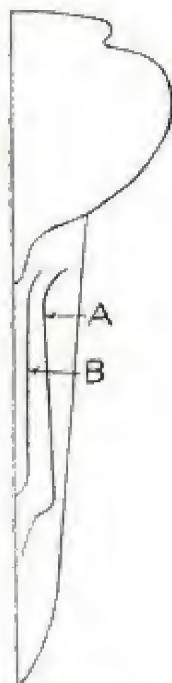


Fig. 1

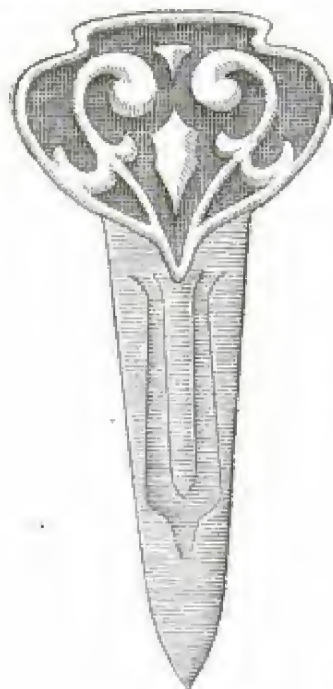


Fig. 2

The Pattern and the Finished Bookmark

head and the extreme length $4\frac{1}{2}$ in. Make one-half of the design, as shown in Fig. 1, freehand, then trace the other half in the usual way, after folding along the center line. Trace the design on the metal, using carbon paper, which gives the outline of the design Fig. 2.

With the metal shears, cut out the outline as indicated by the drawing. With files, smooth off any rough-

A very satisfactory treatment is obtained by etching, then coloring. Clean the metal thoroughly with pumice stone and water or with alcohol before the design is applied. Cover all the metal that is not to be lowered with a thick coating of asphaltum. Allow this to dry, then put on a second coat. After this has dried, thoroughly immerse the metal in a solution composed as follows: 3 parts water, 1 part sulphuric acid, 1 part nitric acid.

Allow the metal to remain in this solution until the exposed part has been eaten about $\frac{1}{8}$ in. deep, then remove it and clean off the asphaltum, using turpentine. Do not put the hands in the solution, but use a swab on a stick.

For coloring olive green, use 2 parts water to 1 part permuriate of iron. Apply with a small brush.

The lines at A and B will need to be cut, using a small metal saw. Pierce a hole with a small drill, Fig. 3, large enough to receive the saw and cut along the lines as in Fig. 4. A piece of wood with a V-shaped notch which is fastened firmly to the bench forms the best place in which to do such sawing. The teeth of the saw should be so placed that the sawing will be done on the downward stroke. The metal must be held firmly, and the saw allowed time to make its cut, being held perpendicular to the work.

After the sawing, smooth the edges of the metal with a small file and emery paper. The metal clip may be bent outward to do this part of the work.

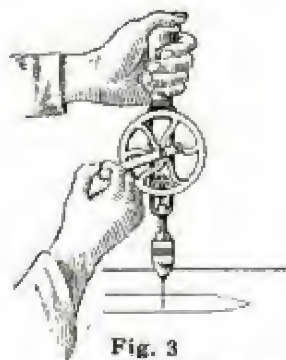


Fig. 3

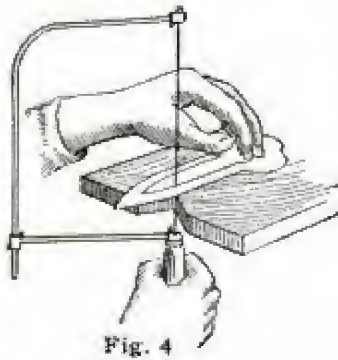


Fig. 4

Drilling and Sawing the Metal

ness and form the edge so that it shall be nicely rounded.

The parts of the design in heavy color may be treated in several ways.

Cheesebox-Cover Tea Tray

The cover from a cheesebox can be converted into a tea tray that is very dainty for the piazza, or for serving an invalid's breakfast.

First sandpaper the wood until it is smooth, then stain it a mahogany color. The mahogany stain can be obtained ready prepared. After the stain has dried, attach brass handles, which can

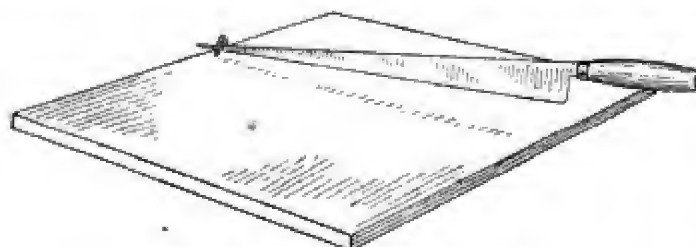
be obtained for a small sum at an upholsterer's shop. A round embroidered doily in the bottom adds to the appearance of the tray.—Contributed by Katharine D. Morse, Syracuse, New York.

Piercing-Punch for Brass

Drill a $\frac{1}{2}$ -in. hole through a block of pine or other soft wood 2 in. thick. Tack over one end of the hole a piece of pasteboard in which seven coarse sewing-machine needles have been inserted. The needles should be close together and pushed through the pasteboard until the points show. The hole is then filled with melted babbitt metal. When this is cold, the block is split and the pasteboard removed. This tool makes neat pierced work and in making brass shades, it does the work rapidly.—Contributed by H. Carl Cramer, East Hartford, Conn.

Kitchen Chopping Board

Cooks can slice, chop or mince vegetables and various other food rapidly by placing the little device, as shown, on a chopping board. It is an ordinary staple, driven in just far enough to allow a space for the end of an ordinary pointed kitchen knife to fit in it. The staple is driven in the edge of the chopping board. The knife can be raised and lowered with one hand, as



Knife Attached to the Board

the material is passed under the blade with the other. Great pressure can be applied and the knife will not slip.—Contributed by M. M. Burnett, Richmond, Cal.

☞ Sew straps to the sides of mattresses and they can be handled much easier.

A Carpenter's Gauge

The home workshop can be supplied with a carpenter's gauge without any expense by the use of a large spool and



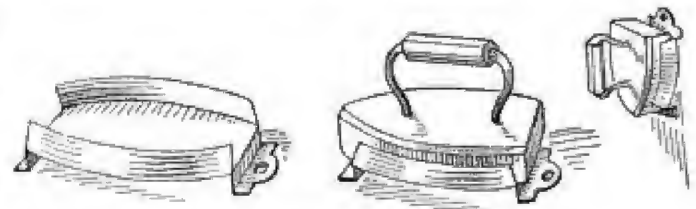
Round Stick in a Spool

a round stick of wood. The stick should be dressed to fit the hole in the spool snugly and a small brad driven through one end so that the point will protrude about $\frac{1}{16}$ in.

The adjustment of the gauge is secured by driving the stick in the hole in the direction desired. A better way and one that will make the adjusting easy is to file the point end of a screw-eye flat and use it as a set screw through a hole in the side of the spool.

A Flatiron Rest

The iron rest and wall hanger shown in the sketch is made of sheet iron. The upturned edges of the metal are



Board or Wall Iron Rest

bent to fit the sloping sides of the iron. The holder and iron can be moved at the same time.—Contributed by W. A. Jaquythe, Richmond, Cal.

Use for Paper Bags

When groceries are delivered, save the paper bags and use them for storing bread and cakes. Tie the neck of the bag with a string and it will keep the contents fresh and clean.—Contributed by Mrs. L. H. Atwell, Kissimmee, Florida.

☞ If a little chalk is rubbed on a file before filing steel, it will keep the chips from sticking in the cuts on the file and scratching the work.

INTERESTING PATENTS.



FIG. 1

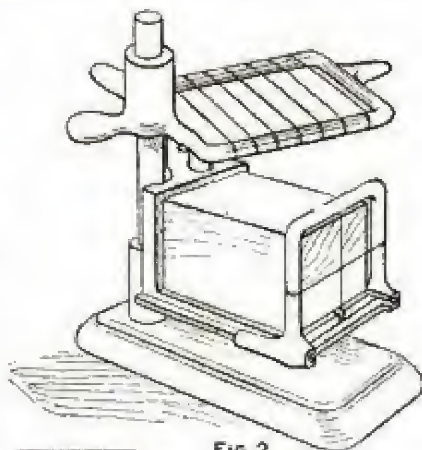


FIG. 2

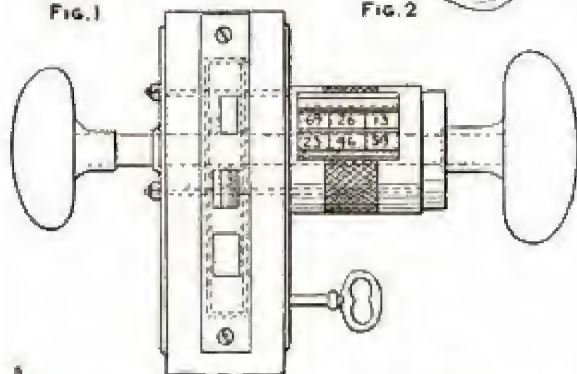


FIG. 3

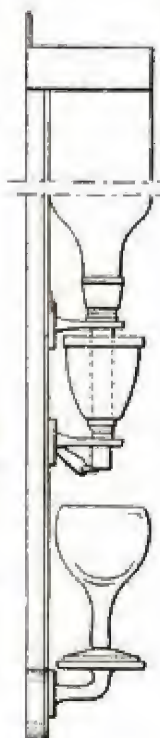


FIG. 4

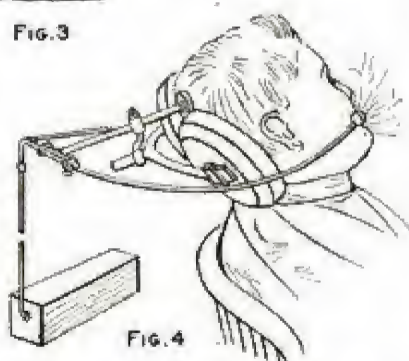


FIG. 5

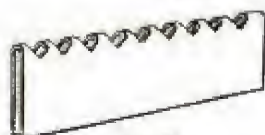


FIG. 6



FIG. 7



FIG. 8

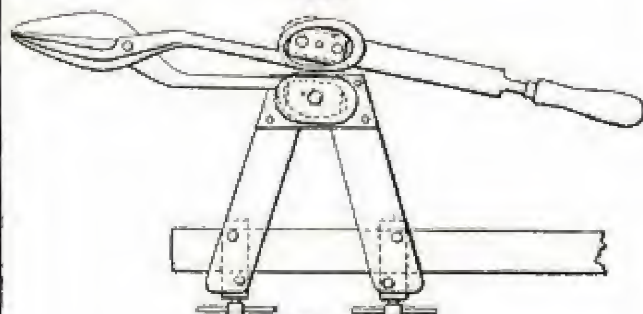


FIG. 9

FOUNTAIN TOOTHBRUSH—A self-contained or fountain toothbrush is shown in Fig. 1. Pure water, or a mixture of tooth paste or powder, may be placed in the receptacle which forms the handle, and be fed to the bristles as required. The reservoir is detachable.

WIRE BUTTER CUTTER—Figure 2 shows a device designed to cut a block of butter into 32 evenly divided portions. The block of butter is first placed on the standard and then the end frame is pushed over it, the two wires stretched across this frame cutting through and dividing the block into four longitudinal sections. Then the top frame is swung over the block and pushed downward over it, the seven wires strung across it cutting through the butter.

COMBINATION DOOR LOCK—Figure 3 is a combination lock for house doors, its members being mounted just inside one of the knobs as shown.

BREATH-BLOWER FOR DENTAL CHAIR—An inventor who wishes to guard a patient from the annoyance caused by the breath of the dentist, has designed the apparatus shown in Fig. 4. A tube, mounted as shown, and fed by a compressed-air tank, delivers a flat blast of air between the face of the patient and the face of the operator. Spring-actuated means attached to the headrest of the dental chair and adapted to be operated by a movement of the patient's head throws the tube and air blast into and out of operative position.

SAW-FILING ATTACHMENT—The filing of saws is said to be simple with the attachment shown in Fig. 5. It comprises a flat plate or member adapted to fit over a saw blade and form both a guard and a guide for the teeth and file respectively. It is provided at its outer edge with a plurality of alternating spaced guards and recesses, which are reversely tapered, the walls of the recesses defined by the front and rear edges of the guards being inclined to accord with the inclination of the saw teeth. Each alternate space separating the teeth of the saw blade is closed by the guards, leaving the spaces between the other teeth exposed.

MEASURING DEVICE FOR LIQUIDS—Figure 6 is a device for automatically drawing off measured quantities of liquids from a bottle, comprising a support for the inverted bottle, a normally sealed measuring chamber set below the bottle, and a ledge for the receptacle into which the measured quantity of liquid from the bottle is discharged.

ICE-CREEPER—A simple non-slipping device to be attached to the heels of shoes worn on ice-covered surfaces is shown in Fig. 7. The device is designed only for shoes worn while working outdoors.

CURIOUS CHIN SUPPORT—Figure 8 shows a chin support which is rather unusual, seeing that it is so designed as to utilize the nostrils as the anchorage for the jaw. It is a device to retain the mouth in a closed position, and comprises a member adapted to engage the chin or lower jaw, a member adapted to enter the nostrils and engage the bony processes of the head, said members being adjustable.

ATTACHMENT FOR METAL SHEARS—Figure 9 is a patent granted on a means of providing greater leverage for metal shears. It consists of a bracket for supporting the shears, and a handle bar to form an extension to one handle of the shears. Blocks on the bracket and on the extension handle fit into the handle eyes of the shears.

BALANCING DEVICE FOR AEROPLANES—This new balancing device for aeroplanes (Fig. 10) is interesting because, whether practical or not in the form shown, it presents an idea which shows possibilities of development. The operator's seat is pivotally suspended from the framework of the

PRACTICAL OR UNIQUE

upper plane of the aeroplane, and the under fastenings of the seat slide upon a curved bar, the whole arrangement being such as to allow the seat to swing right or left with the weight of the operator when the machine tilts. Thus, any lateral movement of the seat with reference to the framework will draw downward the free edge of the balancing plane toward which it moves, automatically setting the planes so as to right the aeroplane.

AN ELECTRICALLY HEATED STEERING WHEEL—Figure 11 is a heated steering wheel for automobiles, electricity from the magneto or dry-cell batteries being utilized as the source of heat. The wheel ring is of hollow metal and contains the heating elements.

LADIES' HAT RETAINER—Figure 12 is a hat securer comprising a flexible band for attachment to the interior of the hat, said band having offset portions with slots adapted to engage a second sliding band mounted within the first. This second band is provided with a series of inwardly curved prongs, which are engaged with the hair when the inner band is pushed around. The turning of the prong-studded band is accomplished by turning the little shaft, which looks like the head of an ordinary hat-pin.

POCKET UMBRELLA—An umbrella which may be quickly telescoped to but one-third its ordinary length, and is only $1\frac{1}{4}$ in. in diameter when so telescoped, is shown in Fig. 13. By pressing a spring and giving a slight turn to one of the caps, both the rod and the ribs may be telescoped, the ribs being gathered tightly together with one hand placed around both ribs and rod while the other hand is being pushed against the handle. The ferrule of the umbrella must, of course, be rested against some firm surface while the handle is being pushed in. The drawing shows the umbrella extended and telescoped.

FOLDING DEVICE FOR IRONING—Figure 14 is a metal folder for use in ironing. It has a seat for the pressing iron and a shoulder against which the butt end of the iron rests as it is pushed over the strip of material to press down the edges folded over.

IMPROVED MOUNTING FOR DEADLIGHTS—A method of mounting vessel deadlights so that the outer surface of the glass may be easily cleaned is shown in Fig. 15. The circular sash is rotatably mounted in a ring which is raised and lowered by racks. When closed against the frame the ring is held fast by a series of wedges carried by a second ring and engaging inclines on the first ring. The outer surface of the glass is cleaned by opening the window slightly, cleaning the portions which can be reached, and then rotating the sash to bring the remaining portions within reach.

ELECTROCUTING TRAP—The electric rat trap shown in Fig. 16 is somewhat complicated in construction and operation, but its construction is such that each rodent electrocuted drops out of sight, so that the bodies will not frighten others away. The electrocuting circuit has one electrode on a trapdoor, while the second electrode constitutes a movable bait-holder. When the rodent steps onto the trapdoor and nibbles at the bait, the electrocuting current passes through its body, and at the same time a motor is set going. This motor drives a shaft, one revolution of which causes the trapdoor to first tilt, dropping the electrocuted body into the pit, and then restores it to its normal position, in which position it remains until another rodent steps upon it and nibbles the bait.

ICE-SKID SWITCH.—Figure 17 shows a switch by means of which the blocks being slid along an ice skid may be deflected either to a right or a left branch, according to the position in which the switch is set.

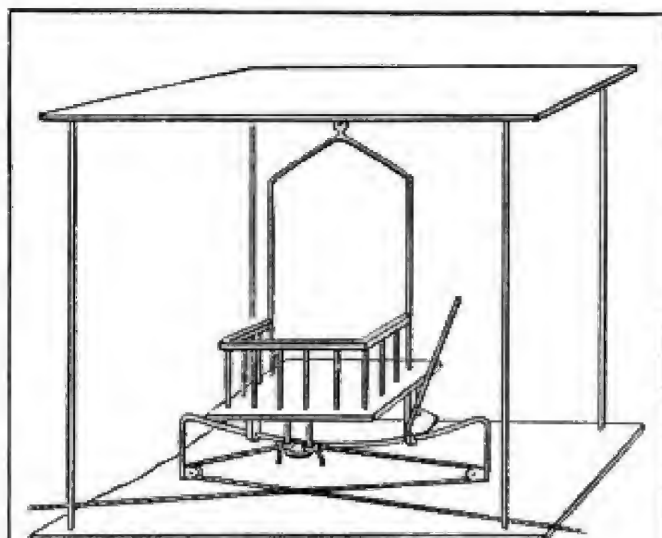


FIG. 10

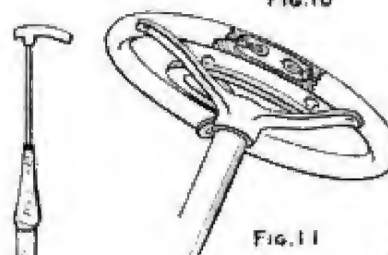


FIG. 11

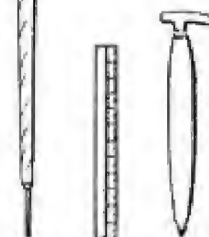


FIG. 13



FIG. 12

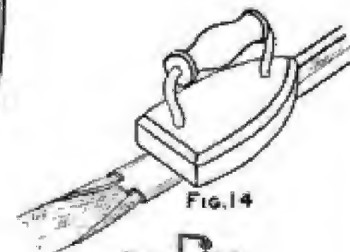


FIG. 14

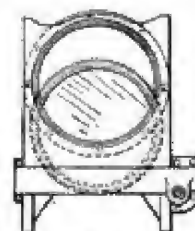


FIG. 15

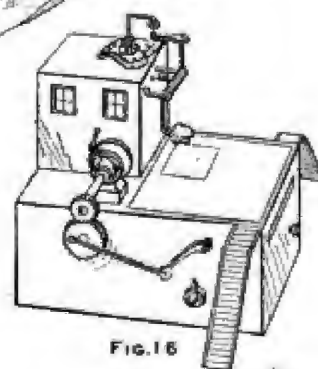


FIG. 16

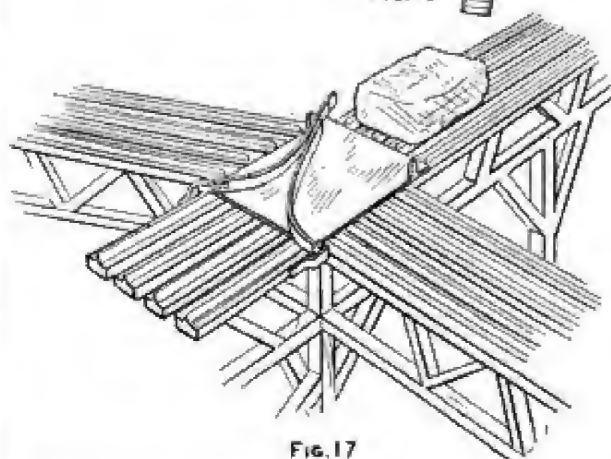
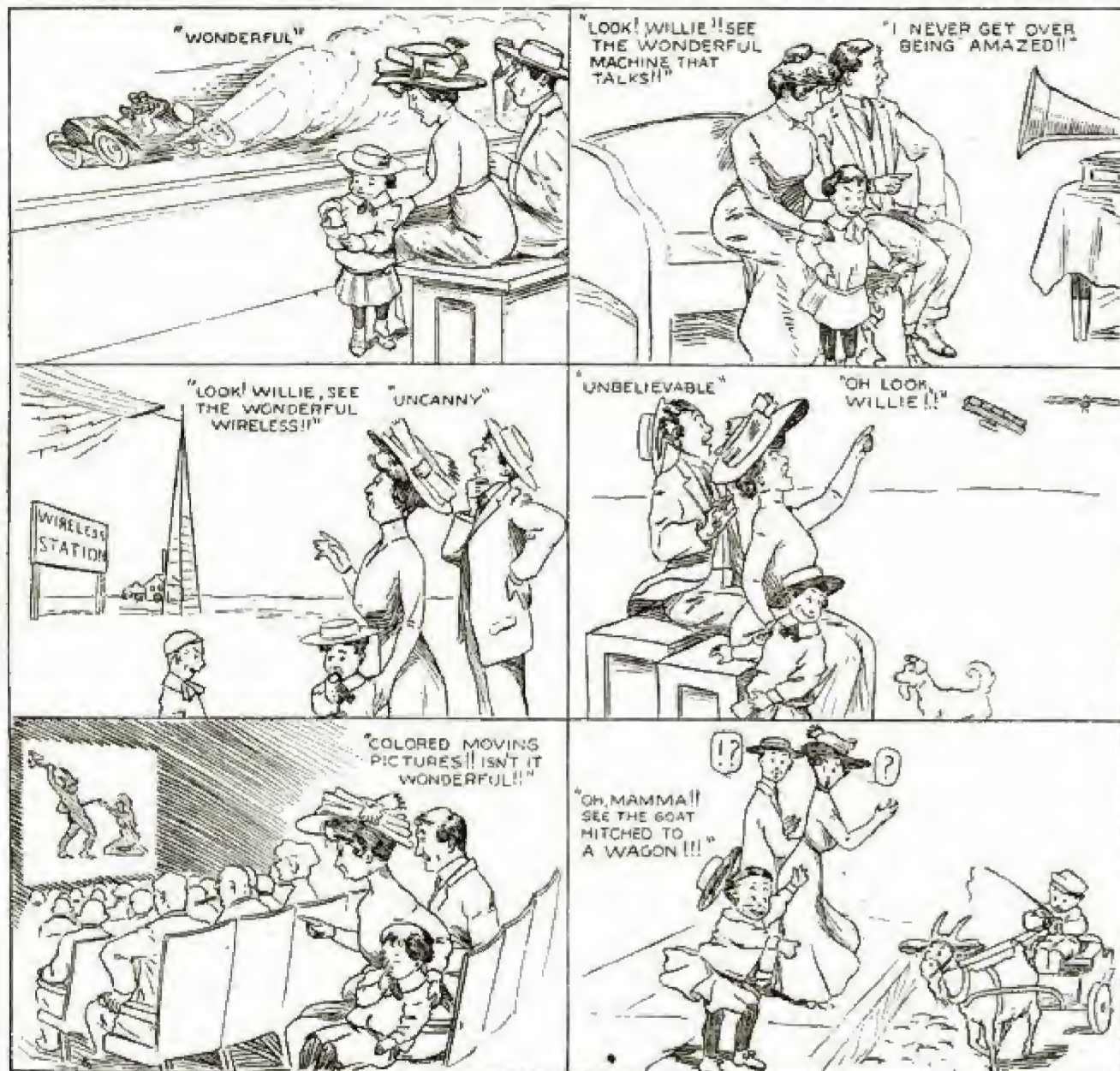


FIG. 17

THINGS DON'T SEEM WONDERFUL IF YOU'VE SEEN THEM ALL YOUR LIFE



McCutcheon—Chicago Tribune

"MR. CLEAVER, how do you account for the fact that I found a piece of rubber tire in one of the sausages I bought here last week?"

"My dear madam, that only goes to show that the motor-car is replacing the horse everywhere."
—New York Times.

"The cynic," said Dr. J. H. Jowett, as he paced the deck of the "Adriatic," "seems to me as foolish and wrong-headed as the schoolboy who refused to play during the recess hour."

"As this boy sat with a discontented look on a hard, stiff bench, a comrade said:

"Why aren't you playing, Jack?"

"Jack frowned contemptuously.

"Catch me playing!" he said. "If I played the recess hour would go too fast."—Los Angeles Times.

"You, there, in the overalls!" shouted the cross-examining lawyer, "how much are you paid for telling untruths?"

"Less than you are," retorted the witness, "or you'd be in overalls, too."—Housekeeper.

The wind was blowing a bit more than a gale one night, when a benevolent old chap stopped to put a dime in the hat of a shivering blind man on the public square. The donor nearly dropped the coin, but the mendicant shoved his hat underneath it and skilfully rescued it.

"Why, you're not blind," cried the giver, scornfully.

"No, sir," confessed the beggar, "I'm just takin' a pal's place while he has a bit o' rest. He's blind, sir—been blind from birth."

"Where is he taking his rest?" demanded the stranger, still unconvinced.

"Why, he—er—why, he's gone to a movin' picture show."—Cleveland Plain Dealer.

The terrible storm had passed, and the angry waves, after engulfing many a gallant craft, had subsided.

The captain of the partially disabled steamship, as land hove in sight, hung a crutch over the star-board bow.

"Merely a bit of stage business," he explained; "all the papers will say tomorrow morning that 'the great ocean liner came limping into port.'"—Chicago Tribune.

"What're ye comin' home with your milk pail empty for?" demanded the farmer. "Didn't the old cow give anything?"

"Yes," replied the boy; "nine quarts and one kick."—Stray Stories.

A nervous-looking man walked into a grocery with his baby on one arm and a kerosene can on the other, placed the can on the counter and said: "Sit there a moment, dear." Then, holding the baby up to the dazed clerk, he added, "Fill this thing up with kerosene."—Marine Journal.

The Tesla Turbine

By E. F. STEARNS

ENGINEERS and men of science throughout the world are awaiting with unusual interest the completion of tests of a new steam turbine designed by Nikola Tesla, which preliminary experiments indicate will give enormous power from a comparatively small and extremely lightweight engine. Ten horsepower to a pound of weight has already been developed with the engines that have been tested and enthusiasts who have witnessed the work of the turbine declare the perfect rotor has at last been found. To what extent this is true, time and the construction of larger units than have yet been used must prove. At present, while the practical experimental stage has not yet been passed, the entire engineering world is profoundly interested in the work that has been done, and awaits future development with much concern.

Operation of the Tesla engine de-

pends upon two well-known properties of fluids: adhesion—the tendency, for example, of a certain amount of water to cling to a smooth metal surface, even when the bulk of the water has been shaken off; and viscosity, the resistance of fluids to molecular separation, the tendency of one drop, in a mass of fluid, to drag adjoining drops with it, if set in motion.

In its simplest form, the new idea takes the shape of the inventor's little "air-diffuser." This consists of half a dozen very thin steel disks, some 9 or 10 in. in diameter, set horizontally, about $\frac{1}{8}$ in. apart, on the upright shaft of a small, horizontal electric motor, the center of each disk being cut away in a 3-in. circle. With current switched into the motor, the disks revolve, and instantly strong suction can be felt by the hand held several inches above the axis, while a powerful current of air is blown from the spaces between the disks. The air, in short, is being sucked into the central opening and hurled out at the periphery. Consider now that disks and shaft have been inclosed in an air-tight case, with an inlet at the axis and an outlet at one point of the periphery; we have an air pump, a Tesla blower, one of which, now in operation, is delivering 10,000 cu. ft. of air per minute. Suppose again that water, instead of air, be the fluid admitted. Entering the cut-away space at the centers of the disks, the adhesion of the metal drags it, in a widening spiral, toward the spinning circumferences, there to hurl it away in a tangential direction; and since the water must now leave the case by its one outlet, we have the Tesla pump, on rather new lines.

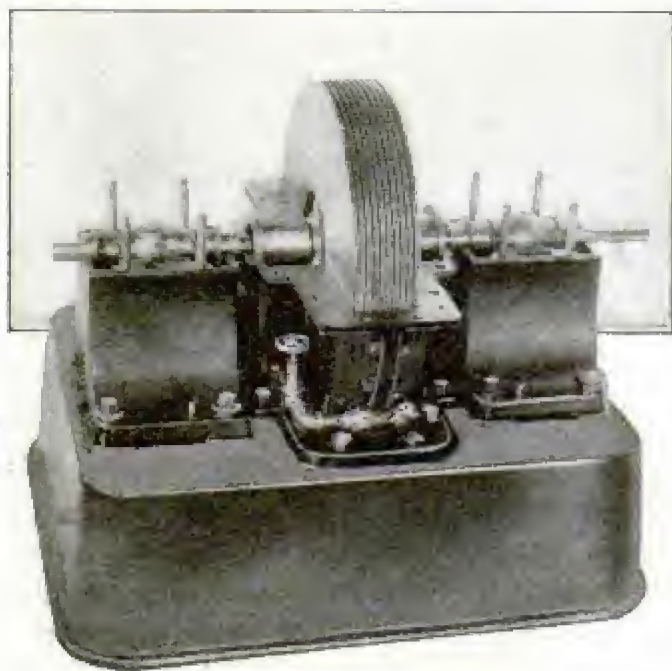
Assume that the pumping process



A Complete 110-Hp. Turbine



The Turbine, Invented by Nikola Tesla, Which is Based on a New Principle



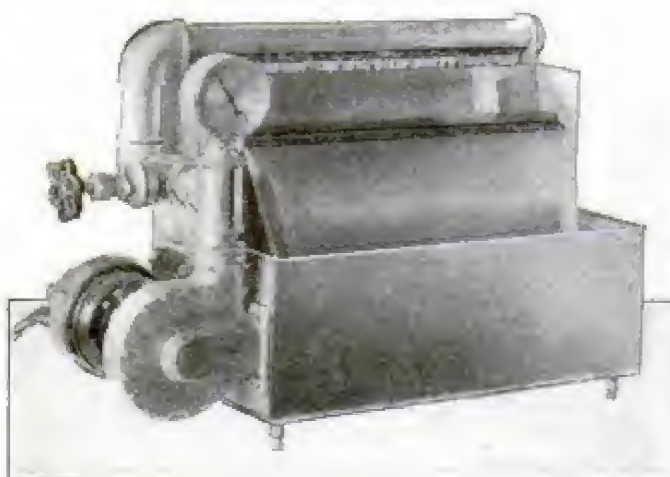
The 200-Hp. Tesla Turbine, with the Upper Section of the Case Removed to Show the Disks, etc.

is to be reversed, that the disks, instead of being turned by an outside force, are to produce power themselves, that steam under pressure has been substituted for the water. The steam, admitted to the case, strikes the edges of the disks and takes the path of least resistance between them, a narrowing spiral toward the outlet through their centers. The disks themselves are dragged around, the shaft is turned and power is being generated in an entirely new fashion.

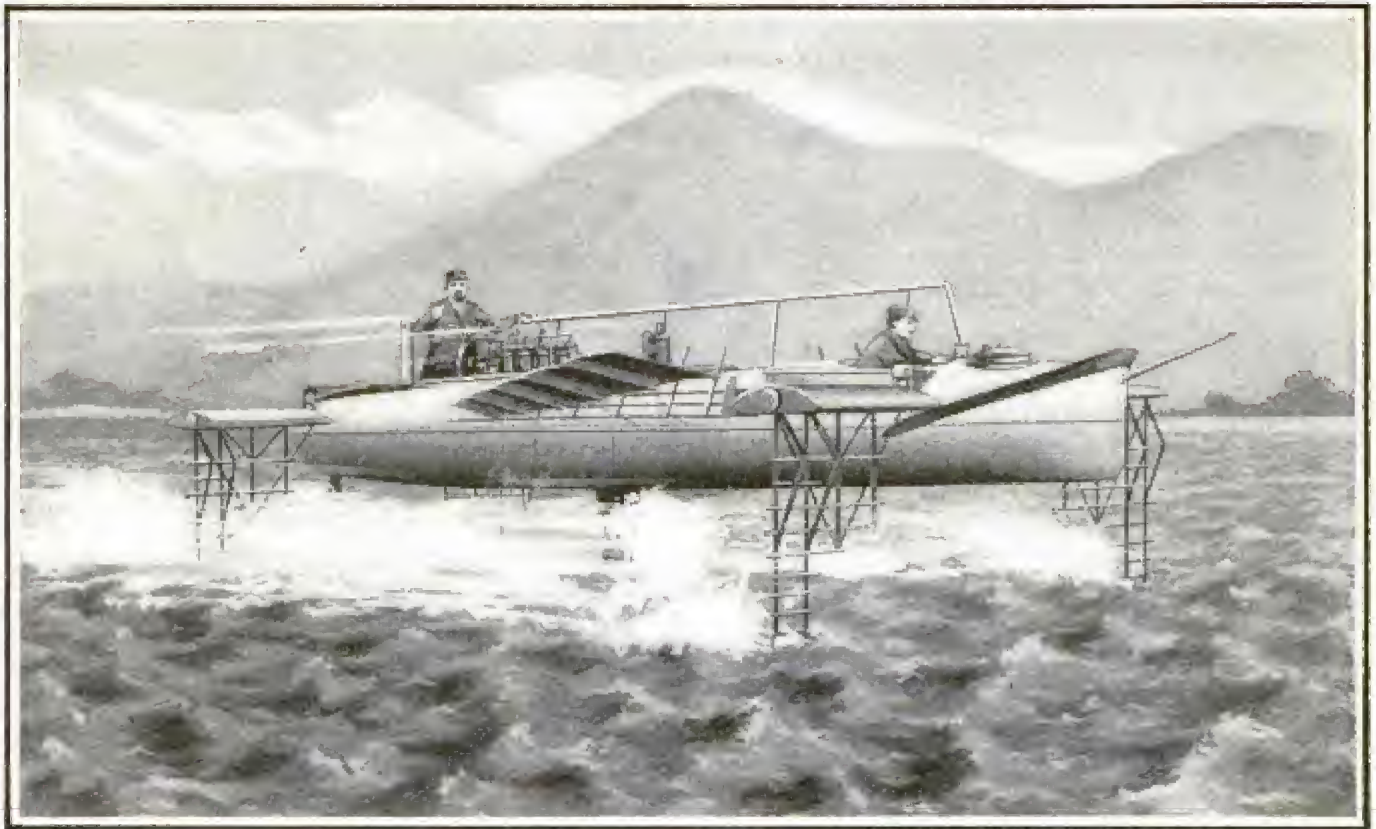
Working under the best conditions—in the experimental laboratory—a single disk of $9\frac{3}{4}$ in. diameter, with a center outlet of $3\frac{5}{8}$ in., will develop 5 hp. Without nearly approaching the limit of strain of the materials, the pressure could be increased so that the velocity of rotation would be doubled and the power quadrupled; so that with a single steel plate, $1/32$ in. in thickness, weighing about $\frac{3}{8}$ lb., and delivering 20 hp., we have a possible 53 hp. to 1 lb. of actually working material. Or a more concrete example can be found in a double Tesla turbine, built for practical service and nearly completed. In this there are two sets of disks, arranged to revolve in opposite directions and each set, developing 200 hp.

Comparison between the old and the newest is best given in the inventor's own words:

"In most engines, a very small proportion of the total amount of material is actively employed in the production of power. For example, in reciprocating engines of the older type, the power-giving portion—cylinder, piston, etc.—was no more than a fraction of 1 per cent of the total weight of material used in construction. The present form of turbine, with an efficiency of about 62 per cent was a great advance, but even in this form of machine scarcely more than 1 per cent or 2 per cent is used in actually generating power at a given moment. The new turbine offers a striking contrast, using as it does practically the entire material of the rotor (the whole surfaces of the disks) as an active source of power, and with an efficiency of 80 per cent or even 90 per cent. Owing to this, it is possible to get an enormous amount of power from a small space. Assuming sufficient boiler capacity on a vessel such as the "Mauretania," it would be perfectly easy to develop, instead of some 70,000 hp., 4,000,000 hp. in the same space—and this is a conservative statement."



A little model pump in which five disks, 3 in. in diameter, contained in the lower front, circular case, throw 40 gal. a minute when the little electric motor is started up. The water flows out of a slit at the bottom of the upper pipe and flows back to the lower tank as seen in the foreground. This model illustrates one point astonishingly: the power can be shut off when the pump is in full operation and everything stops instantly without the slightest jar. With the power switched on suddenly, the full flow is resumed so quickly that the interval between the click of the switch and the full stream of water is too small to be determined with an ordinary watch.



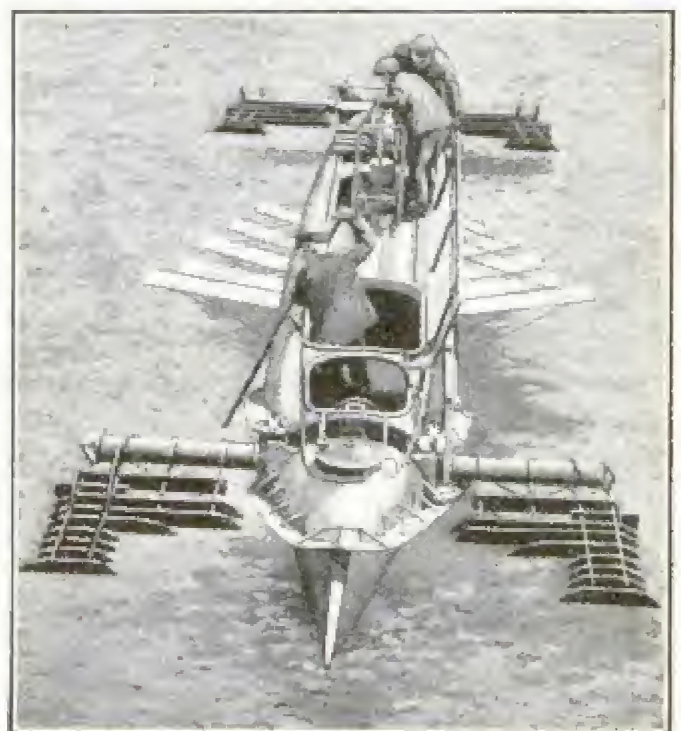
At 45 Miles an Hour is High above the Water and Only the Bottom Planes are Immersed

ITALIAN HYDROPLANE OF CURIOUS TYPE

This curiously constructed hydroplane, designed by Signor Forlanini, has attained 45 miles an hour in its trials on Lake Maggiore, Italy, where Dr. Alexander Graham Bell was recently given a ride, and it is expected that this speed will be greatly increased by new modifications.

The remarkable craft is described as one making true hydraulic flight, it being sustained by the water in the same manner that birds and aeroplanes are sustained in the air. That is, it is sustained by the dynamic reaction of the water on the planes, most of these planes remaining completely out of the water while the machine is in action. A feature for which much importance is claimed is that the resistance of the water does not depend on the speed, but remains constant, and is equal to half the total weight of the apparatus. The weight is 4,000 lb. with two persons on board, and the gasoline motor has a capacity of 100 hp. The hull is 32 ft. long, and across the bow and stern are two

strong steel tubes, to both sides of which, starboard and port, fore and aft, are frameworks containing a series of planes. When the hydroplane is at rest the hull lies in the water like that of an ordinary boat, the planes,



Lying at Rest with the Four Series of Planes Swung Upward

which have a slight horizontal inclination and are arranged one above the other in each of the four groups, being immersed in the water. As soon as the hydroplane begins to move forward under the force of the propeller, which is carried on a hollow fin amidships, the water exercises a vertical force on the planes, and the hull tends

to rise. As more and more speed is attained the hull rises until it is completely out of the water. The speed then rapidly increases, and, little by little, the various planes rise out of the water, until, when the maximum speed is attained, only the bottom planes remain in the water, as is shown in one of the illustrations.

WIRELESS CALLS HEARD ACROSS THE PACIFIC

"I am not getting you very well," reduced almost to a wireless whisper, sent a thrill through the wireless operator in the Hillcrest station on San Francisco Bay, Oct. 8, when he recognized the "sign" at the end of the message to be that of the man in charge of a station on the island of Hokosha, one of the most northern of the Japanese group, which was 6,000 miles away. The publication of the prosaic, though extremely practical, sentence also sent a thrill through wireless men throughout the country, as it was the first authentic message that had been received from so great a distance across the Pacific, and sig-

nalized the knitting of America and Asia in the wireless net which is encompassing the globe. This message came in answer to signals sent out from Hillcrest, and at first it was thought to have originated on a Japanese ship then en route from Honolulu to San Francisco. A little later the operator at Hokosha told his American confrère he was "getting" him much better. The interchange of messages went no further than this and the operators have been unable to "get" each other since. The wireless company has written to the Japanese government to officially confirm the receipt of the message.



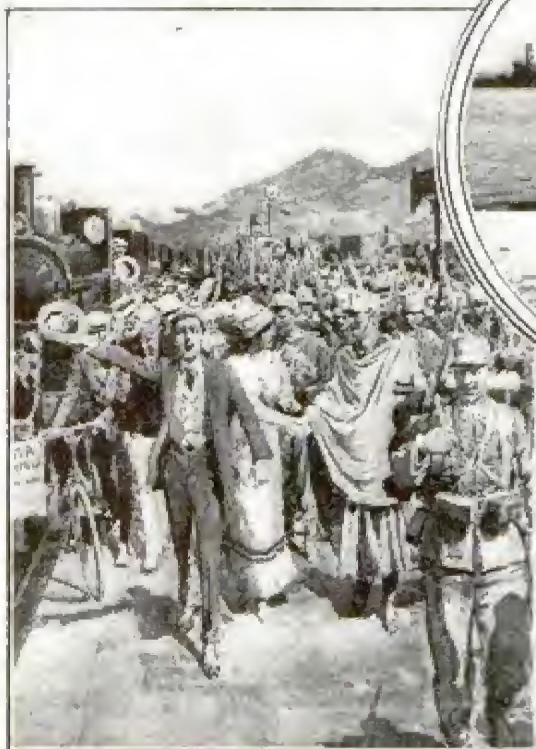
THEATER OF MILITARY AND NAVAL OPERATIONS OF ITALY AGAINST TURKEY

Up to date the war into which Turkey and Italy were suddenly plunged has involved little else than the bombardment and occupation of Tripoli by the Italians, with a few skirmishes, to Italian advantage, between ships of the opposing nations at other points in the Mediterranean and Aegean seas. The fall of Tripoli followed a vigorous bombardment from the Italian fleet and its occupation by Italian troops was only resisted in a passive fashion. Unauthentic press reports indicate fighting in the desert outside the captured city, but owing to a strict censorship nothing definite has been developed. The movement of the Italian army and navy was accomplished with great celerity and has been highly praised by military authorities. Whatever international effect the war may have, it will take a notable place in history as the first in which aeroplanes have been used in actual military operations for both scouting and dropping bombs on the enemy.



Trenches of Italian Troops in the Sand

Banks outside the Town of Tripoli



Crowds Cheering Italian Troops
Departing for the Front



Italian Naval
Officer Examining a
Shell Which Struck
the Beach but Did
not Explode



Bombardment of Tripoli as Seen
from the Warships



Troop of Turkish Cavalry Crossing a Stream in the Desert

ITALY'S WAR ON TURKEY AND THE SEIZURE OF TRIPOLI

BOMB-DROPPING DEVICE FOR AEROPLANES

A bomb-dropping apparatus for aeroplanes, invented by Riley E. Scott, formerly a lieutenant in the U. S.



Starting on a Test Flight with Bomb-Dropping Device which Takes Scientific Consideration of All the Factors Such as Height, Speed, Etc., Necessary in Determining at What Moment a Bomb should be Dropped to Strike the Desired Object

army, has been given several tests in an army biplane, with Lieut. Milling as pilot. This device comprises a series of concentric rings mounted as gimbals at right angles to each other, and a telescope, with graduated arc and vernier, mounted on the inner ring at right angles to the plane of the ring. The center of gravity being considerably below the center of support, the inner ring assumes a horizontal position when symmetrically loaded. Two bombs, provided with guides in the form of tails, rest in canvas slings, from which they are released at the proper moment. The line of sight of the telescope describes a vertical plane when revolved, enabling the operator to lay off the angle for the particular height and speed.

TO CONNECT THE BRITISH EMPIRE BY WIRELESS

A scheme is now under consideration by the British government to unite the various parts of the empire by a wireless-telegraph system having direct communication with the Admiralty in London. The first chain of imperial high-power wireless stations contemplated will have stations at Gibraltar or Malta, and at Cyprus, Aden, Bombay, Singapore, and in Australia. England and Canada are already in communication, and Mr. Marconi has been carrying out experiments in Newfoundland with a view to perfecting this system.

¶ Capt. Klaus Larsen has again shown his contempt for the dangers that encompass a trip through the Whirlpool Rapids of Niagara in a small boat and his faith in the staunchness of his motorboat. Captain Larsen's second trip through the rapids was made Oct. 29. The trip through the 6 miles of turbulent waters occupied just 28 min.



FLAG OF THE CHINESE REVOLUTIONISTS

The flag of the Chinese revolutionists has been hoisted in several places in the United States. The feature of the flag is a large star in the upper corner. Aside from this it is plain colored bunting. The star bears a strong resemblance to the "rising-sun" emblem of the Japanese. The photograph shows the flag at the headquarters of the rebel committee in New York.



A PHILIPPINO FARMER preparing his land for a rice crop. These far-away Islands of the Sea, inhabited by an inferior race, are said to be so fertile that an entire family can be supported by its own back-yard. The above is but one of over 1,200 striking photographs in the wonderful and interesting Set of Books,

OUR ISLANDS AND THEIR PEOPLE

Consisting of two sumptuous, royal quarto volumes, 12 by 16 inches, and containing 1,200 wonderful photographs taken expressly for this work by America's famous outdoor photographer, Walter B. Townsend, on that famous Expedition through the wilds of Cuba, Porto Rico, Isle of Pines, Hawaiian Islands, Samoa, and the Philippines, which occupied more than a year's time and cost over \$35,000. Besides these marvelous photographs the work contains 800 pages of interesting narrative and descriptive matter of these far-away islands, written by the noted Author and War-correspondent, José de Olivares, under the supervision and direction of our Editor, the late Major-General Joseph Wheeler. The subject matter is written in Mr. Olivares' most fascinating style and accurately portrays the manners, customs and characteristics of these peoples and recounts fully the vast natural resources of the Islands themselves.

The Philippine Islands are 20,000 square miles larger than Great Britain and Ireland put together and are a veritable "promised land," so wonderfully rich are they in natural resource. For 400 years Spain tried to civilize the Philippine Islanders, but her efforts had little effect on that vengeful and treacherous race. How Uncle Sam will deal with the Philippino problem must be decided by the voters of the United States, and in order to form a correct opinion, every American citizen should have at hand the best source of information regarding our Island possessions. Now is your last chance. The Editor, Major-General Joseph Wheeler, is dead, the plates have been destroyed according to agreement and no more of these books will ever be printed again.

ONLY $\frac{1}{3}$ REGULAR PRICE

The regular price of this great Set is \$15.00, and over 400,000 sets have been sold at that price, but the plates are destroyed and in order to make a clean-up sale, the remaining sets will be sold at one-third the regular price - **only \$5 per set.** Fill out the coupon and mail it to us and we will send you the books for five days' free examination in your own home. Then if you are perfectly satisfied, send us \$1 as first payment and \$1 a month for four months until this "Special Sale" price of only \$5 is paid. If you are not satisfied return them at our expense.

A CHRISTMAS GIFT

These books are so entertaining and fascinating they would make an ideal Christmas present for anyone. Remember no more will ever be printed and they are going fast. Mail coupon today.

THE
THOMPSON
PUBLISHING
COMPANY,
1127 Pine Street,
ST. LOUIS, MO.

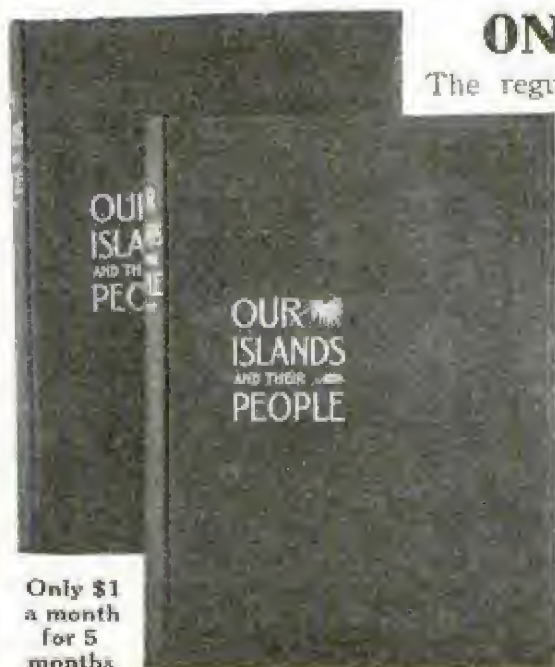
Send me for five days' free examination, one set of OUR ISLANDS AND THEIR PEOPLE. If I am satisfied with them I will send you, within five days, \$1 as first payment and \$1 a month for four months thereafter until the "Special Sale" price of only \$5 is paid. If I do not wish to keep the books, I will notify you within five days after arrival.

NAME.....

OCCUPATION.....

ADDRESS.....

12-11 P M



Only \$1
a month
for 5
months



INTERNATIONAL CORR

Check this coupon without further delay for the best

Automobile Handling
Mine Superintendant
Mining Foreman
Painting, Steam Fitting
Copper, Blacksmithing
Civil Engineering
Textile Manufacturing
Structural Engineering
Telephone Expert
Mechanical Engineering
Electrical Engineering
Electric Lighting Super

Name _____

Present occupation _____

Street and No. _____

City _____

This Man

is sure of himself and marks
the I. C. S. coupon confident that it
will benefit him in salary and position.

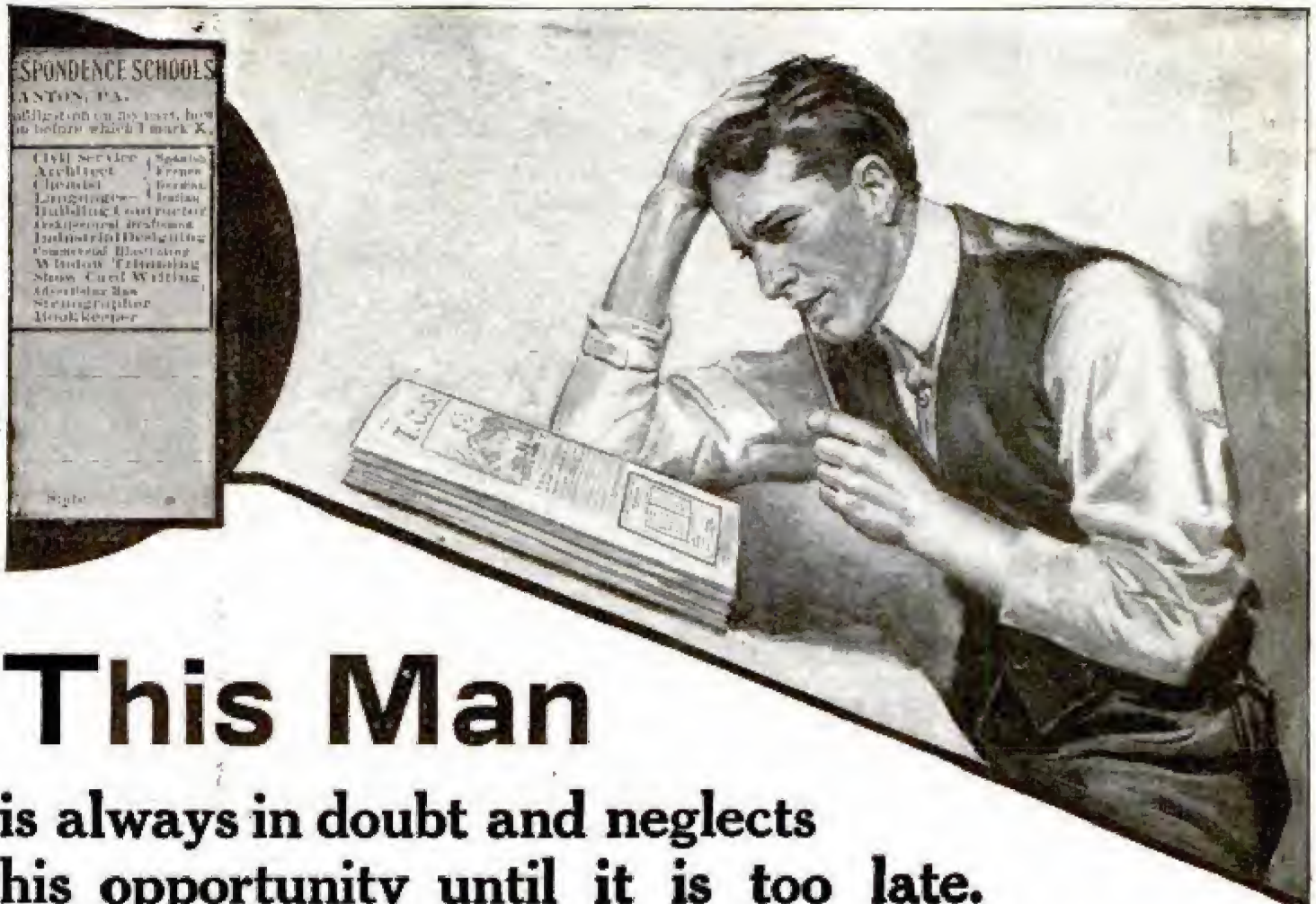
There are thousands upon thousands of "confident" men who have marked this coupon, and as a result are today occupying high-salaried positions. But there are still thousands of "perplexed" men who are putting off the marking of this coupon simply because they are wondering whether the I. C. S. can help them.

If you belong to the "perplexed" class, the I. C. S. says to you frankly that you are doing yourself a great injustice in not at least investigating a plan that cannot help but increase your earning power.

You do not have to take the word of any one person for this, because every month there is an average of over 400 I. C. S. students who voluntarily report an increase in salary as a direct result of I. C. S. training. The I. C. S. will give you their names and addresses, and will send you the record of thousands of others who are in the prosperity army of the I. C. S.

WILL YOU MARK THE COUPON?





This Man

is always in doubt and neglects
his opportunity until it is too late.
Which kind of a man are you?

Every man who reads has read about the International Correspondence Schools, and how they benefit working men in every branch of industry. The first step in the I. C. S. system is to clearly explain to the worker how he can be benefited—how little it will cost in time and money, and how quickly he can get returns.

To make this easy the coupon appearing in this announcement has been devised. All you have to do is to choose the occupation you prefer, mark and mail the coupon.

Doing this does not bind you to pay any money or do anything further unless you desire. It simply enables the I. C. S. to give you information applicable to your particular case.

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 872, SCRANTON, PA.

Explain, without further obligation on my part, how I can qualify for the position before which I mark X.

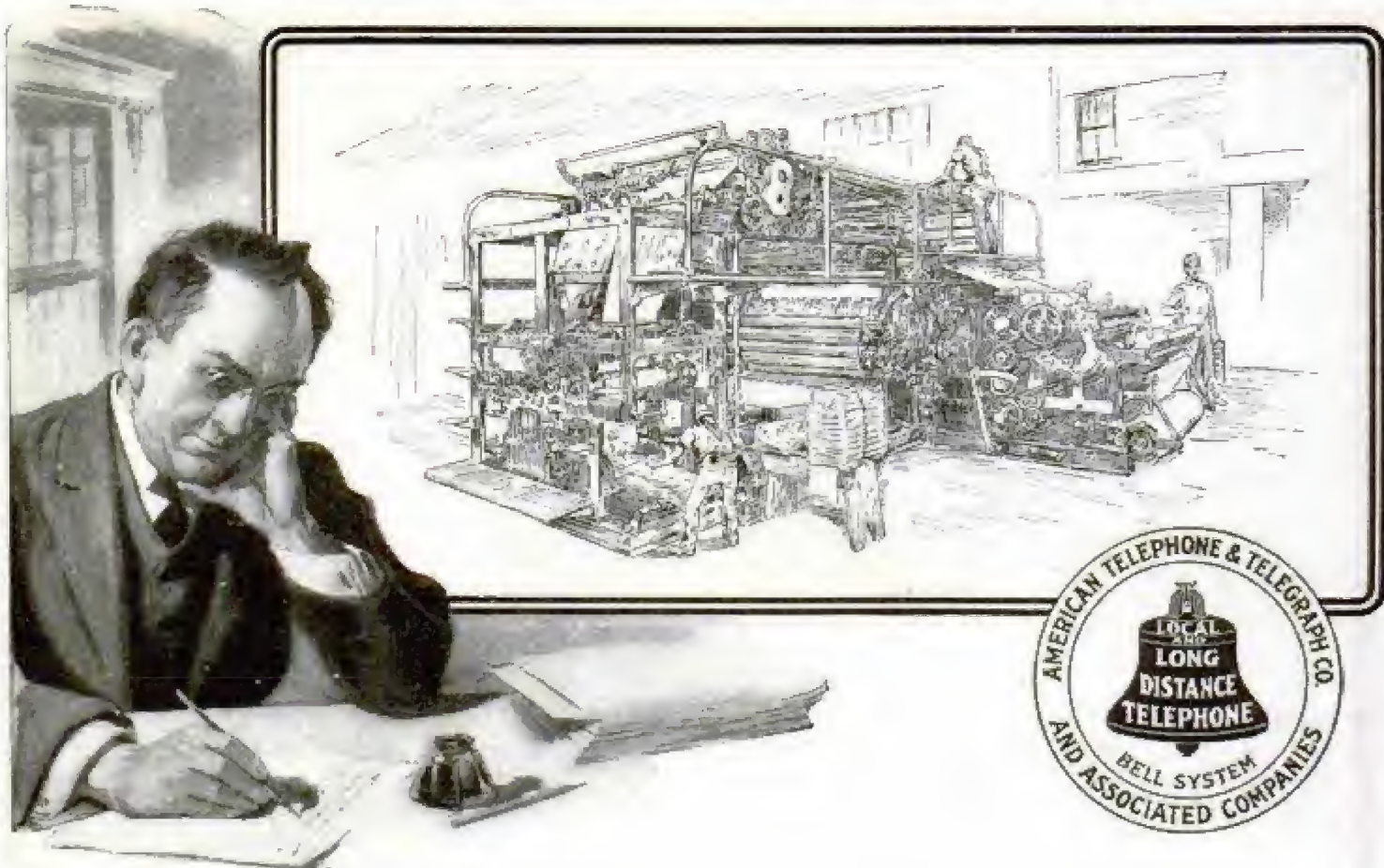
Automobile Running	Civil Service	Spanish
Line Superintendent	Architect	French
Mine Foreman	Chemist	German
Plumbing, Steam Fitting	Languages	Italian
Concrete Construction	Commercial English	
Civil Engineer	Building Contractor	
Textile Manufacturing	Architectural Draftsman	
Stationary Engineer	Industrial Designing	
Telephone Expert	Commercial Illustrating	
Mechan. Engineer	Window Trimming	
Mechanical Draftsman	Show Card Writing	
Electrical Engineer	Advertizing Man	
Elec. Lighting Supt.	Stenographer	
Agriculture	Bookkeeper	
Electric Railways	Cotton Manufacturing	
Structural Engineer	Woolen Manufacturing	
R. R. Construction	Toolmaking	
Metal Mining	Foundry Work	
English Branches	Pattern Making	
Gas Engineer	Blacksmithing	
Foreman Plumber	Surveyor	
	Poultry Farming	

Name _____

Present Occupation _____

Street and No. _____

City _____ State _____



For Universal Service

The Press and the Bell System

The power of the individual writer is multiplied by the printing press. In the same way the power of the individual telephone is multiplied by the Bell system. In both cases, increased usefulness comes from progress towards universal service.

By means of the press the knowledge and thoughts of writers are spread throughout the land, maintaining among all the people the common language and the mutual understanding which makes for national co-operation.

By means of the Bell system, each individual telephone becomes connectable

with every other telephone and each unit in the nation is given a personal membership in the most highly developed system of communication that the world has ever seen.

The press prepares people for co-operation; the Bell telephone system enables them to really co-operate. The press educates people separately; the telephone enables them to act upon their mutual knowledge immediately and at any distance.

By co-operation with telegraph and cable systems, universal service for communication is being made international.

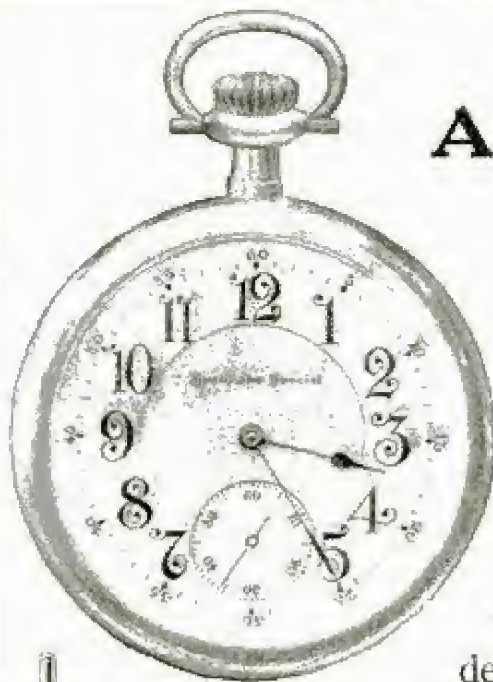
**AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES**

One Policy

One System

Universal Service

Startling Watch Offer



READ!

A Watch Offer Without Parallel

✎ Write for our **FREE** book on watches; a book that posts you on watches and watch values—explains reasons for our most remarkable rock-bottom-price offer **DIRECT TO YOU** on the highest grade Burlington.

IF YOU WANT a highest grade watch (ladies' or gentlemen's), or if you ever expect to own such a watch, write **NOW** for the **FREE** Burlington book. See coupon below.

We won't "knuckle down" to selling systems among dealers, so we have decided to make such a tremendous and wonderful offer direct to the public on a first-class time piece, that no trust, no dealers under contract will or can stop us. **You too** will seize this opportunity to get the "Burlington Special" direct on this wonderful offer.

You should not buy a worthless watch just because it is cheap. Nor need you pay trust prices now for a top-notch watch. The free Burlington book explains.

\$2.50 a Month at the Rock Bottom Price

\$2.50 a month for the world's most superb time piece? The easiest payments at the rock-bottom price—the **Rock-Bottom** price. To assure us that everybody will quickly accept this introductory direct offer, we allow cash or easy payments, just as you prefer.

No Money Down

We ship the watch on approval, prepaid (your choice of ladies' or gentleman's open face or hunting case). You risk absolutely nothing—you pay nothing—not one cent unless you want the great offer after seeing and thoroughly inspecting the watch.

Get the Free Burlington Book

THIS BOOKLET will quickly convince you too that you **DO** want an independent watch—made in the independent factory that is fighting the trust as best it can by giving better quality and superior workmanship throughout; we will quickly convince you that the Burlington watch, on which there is only **one** rock-bottom price (the same rock-bottom price everywhere), is **THE** watch for the discriminating buyer; that it is **THE** watch for the man or woman who wants, not the largest selling brand which everybody has, but the **best** watch, the watch bought by experts, **THE** watch that is absolutely perfect in its many points of superiority—the **Burlington Watch**. You will be posted on **inside facts** and prices when you send for the Burlington Company's free book on watches.

BURLINGTON WATCH COMPANY

Dept. 1199 19th and Marshall Blvd., Chicago, Ill.

Now Write

for the free book. It will tell you what you ought to know before you even examine a watch. It will tell you the inside facts about watch prices, and will explain the many superior points of the Burlington over the double priced products. Just send your name and address today.

No Letter is Necessary.
COUPON
Will Do

**BURLINGTON
WATCH CO.**

Dept. 1199, 19th and
Marshall Blvd.

CHICAGO, ILLINOIS

Please send me (without obligations and prepaid) your free book on watches and copy of your \$1,000 challenge, with full explanations of your cash or \$2.50 a month offer on the Burlington Watch.

NAME.....

ADDRESS.....



You save \$25.00 to \$75.00 when you buy our lathes.

You are the loser if you don't buy your machinery from us.

Write for our Machinery Catalog "M." Mailed free. It puts you under no obligations whatever.

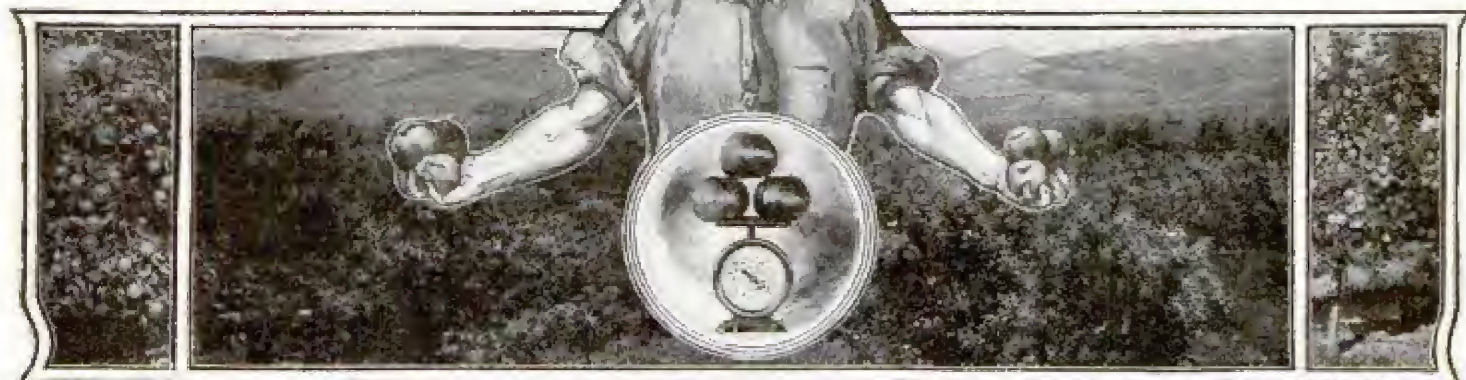
Our lathes are practical in design, unexcelled in workmanship, and size for size, considerably heavier than other makes that will compare with ours in general design.

They are made to satisfy, and we guarantee them. If the lathe is not what we claim it is, **we want you to send it back at our expense.** We have sold hundreds of lathes and not one has failed to give satisfaction.

PRICES RANGE FROM \$60.00 UP.



Address, SEARS, ROEBUCK AND CO., Chicago

\$5,000.**A Year****6 Months'****Vacation**

Do You Want the Job? Is that enough income for you and long enough time to enjoy it in fishing, hunting, travel or some other way? All right—now we'll proceed to explain how you can secure such an enviable position away from the noise and nerve racking turmoil of the city. Where you can obtain personal freedom and independence, best of health and enjoy with your family the ideal life. Such an opportunity comes but once in a lifetime. It presents itself now to any one who has \$50. in cash and a present fair income.

Our plan of selling

Improved Orchard Tracts

practically amounts to loaning you \$2,500 to \$5,000 with which to buy and cultivate a 5 to 10 acre orchard on improved, well irrigated land, in the most famous apple growing region in the world!

The Sunnyside Bench Lands on which our tracts are located, are the very garden spot of the Bitter Root Valley!

They are the best situated as to city advantages, schools, universities, churches and amusements. Big game abounds in the adjacent mountains, fine fishing is found in the waters of the valley.

You must get our printed literature, to read and appreciate the full details of the ideal soil and climatic conditions which make this region the finest apple growing region in the world; together with statistics of undeniable facts of production, all endorsed and supported by the highest authorities in the world, including government reports, horticultural experts and practical orchardists.

Everything Conducive to Perfect Fruit

Our tracts are abundantly irrigated from a great irrigation system costing nearly \$4,000,000. The drainage is perfect. The apples grown there are hardy and perfect—as one government official observed, "not one worm in a hundred thousand boxes," big, bright, sound, toothsome fruit, ideal for export as well as domestic markets.

There are no destructive frosts; wormy fruit and crop failures are unknown. Transportation facilities splendid, social atmosphere and living conditions ideal, climate perfect, cool nights and long, sunshiny days. Everything that tends to health, happiness and prosperity.

\$5,000 Yearly for Life from 10 Acres

A Bitter Root apple orchard bears commercially in its fifth year. Ten acres, fully developed, will return you during early maturity, strictly net, a profit of from \$2,000 to \$5,000 yearly. Beginning with the tenth year from planting,

judged by experience of others, 10 acres will net you an income of \$5,000 yearly and employ only half your time.

If you have a fair-sized income now and are willing to improve your condition, you do not need capital to possess one of these big-paying orchards.

Our Proposition and Plan

briefly stated, is this: We will sell you a choice 10 acre Orchard Home Tract, already planted (spring of 1911) to best standard varieties (all apples, or apples and cherries)—with the Company's definite, written contract to care for and develop your orchard under expert horticultural supervision for 5 years from date of planting, including all land taxes and irrigation charges—for \$500 an acre.

The land will easily be worth, conservatively stated, in fair comparison with other improved lands, \$1,000 an acre. There's a clean profit to you of 100% on a 5 year investment, at the outset. Only a \$50 cash payment required now to secure your orchard tract—balance in easy payments divided over a ten-year period. Your payments for the next few months are practically all the cash outlay you will have, as your orchard tract will pay for itself during the buying period and yield you a handsome profit besides!

Fractional orchard tracts of 5 acres and over at proportionate prices and easy terms—(\$25 monthly for 5 acres.)

Our orchard contracts contain the fairest and most liberal features ever offered you.

Responsibility of Our Company

We are the largest orchard planters and growers in the Northwest.

Our guarantees and contracts are as good as bonds for we have assets of over \$5,000,000; our lands are paid for; we are not hampered with debts, encumbrances or other "promotive" needs. We have plenty of money to finance both ourselves and our buyers. Buying these Bitter Root Valley Orchard Home Tracts is like buying government bonds on easy payments—except that the returns are infinitely larger, and you are at the same time making a future ideal home for yourself and family!

Write today for our free illustrated book—for here's a proposition it will certainly pay you to investigate.

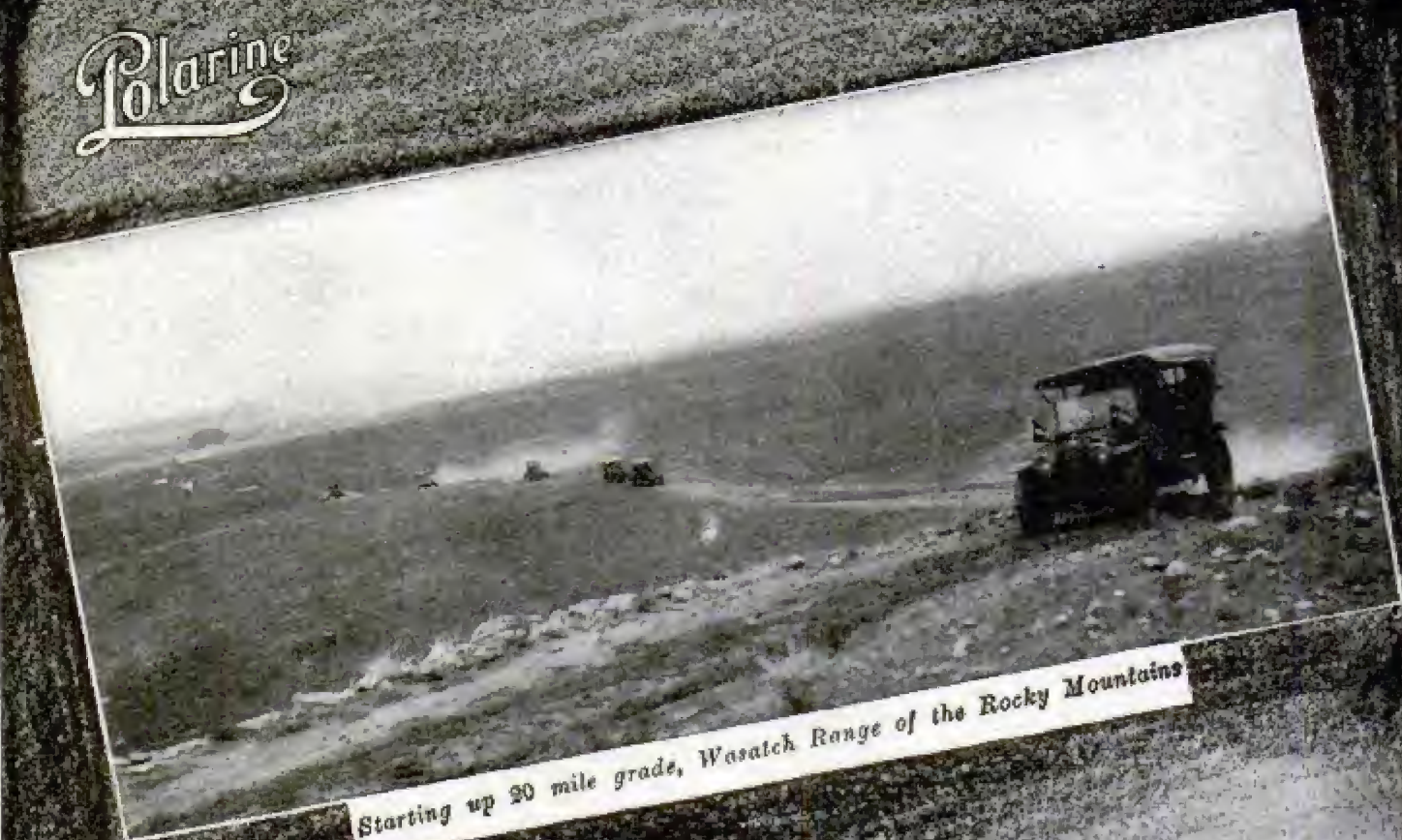
BITTER ROOT VALLEY IRRIGATION COMPANY

838 to 846 First National Bank Building, Chicago, U. S. A.



Typical Bitter Root Valley Orchard Home

Polarine



Starting up 20 mile grade, Wasatch Range of the Rocky Mountains

PREMIER MOTOR MFG. CO.

Indianapolis, Ind., Aug. 30, 1911.

Standard Oil Company,

555 West 25th Street, New York.

Gentlemen:—On the recent Ocean to Ocean run of the Motor Tourists, Polarine Oil, Polarine Transmission Lubricants and Polarine Greases were used on all the cars.

The lubrication of Polarine was ideal.

While we carried large African water-bags to supply water for our radiators in the event of overheating in the steady climbs and steep grades of the Rockies, Sierra Nevadas and the coast ranges west of Omaha, they were practically unnecessary.

A heated motor was, almost unknown. There was also notable freedom from carbon deposit. Furthermore, the stops where Polarine could be obtained were so numerous that at no time were we embarrassed in purchasing supplies.

The Polarine Transmission Lubricants and Greases rendered equally satisfactory service.

Very truly yours,

J. G. MONIHAN,
Secretary Motor Tourists.

Polarine

Stands up under
the severest test.

Are You Using Polarine on Your Car?

Send to our nearest agency for
"Polarine Pointers." It contains use-
ful hints on the care of motor cars.

Standard Oil Company

(Incorporated)

My Famous Anti-Nicotine Pipes at Forty Cents Each, Three for a Dollar

I want thousands to know how a smoke can be improved by the construction of a pipe and by the materials put into it.

SMOKERS talk about the flavor, aroma and smoothness of tobacco. I know tobacco—so listen to me. A lot of that flavor, a lot of that aroma and a lot of that smoothness is *made or killed* by the pipe you smoke. Everybody knows it. I know men who have spent years trying to find a pipe they could smoke—and who today consider my scientifically-made Anti-Nicotine Pipes simply wonders! Some of them have actually given up other forms of smoking.

Handsome Models!

My Pipes Kill the Poison as Well as Improve the Smoke

Here's my original Anti-Nicotine Pipe at the top of this advertisement, and my new Anti-Nicotine Calabash Pipe at the bottom of this advertisement.

In both these pipes I put the famous bowl that does the work—that makes the nicotine disappear. This bowl is made of a material as old as the Babylonians, a material that is like clay, a special composition first discovered by the ancients. This material is as hard as any clay, but it has a peculiar porous quality—just like the finest meerschaum—which *absorbs* the nicotine, keeps it out of your system and uses it to give the pipe a beautiful meerschaum coloring. I know that this special low price cannot blind you to the *quality* in these pipes. I know that the value to the health and enjoyment of my customers of these perfectly-made pipes, will get me twenty more customers every place that I send one now.

ANY THREE FOR A DOLLAR

Above is my popular claw design—the kind you see at the rich men's clubs. And below I show my new Calabash, modeled after the original African Calabash Gourd, graceful and highly finished, trimmed in German Silver. The claw design colors like the finest Meerschaum; the Calabash colors and looks *exactly* like the genuine African article which sells anywhere from \$3.00 up. With them there is no burning the tongue—no charred wood fumes—no disgusting odor—and you do not have to "break them in." Any three for a dollar. Choose two of one design and one of the other, or all three of the same—just as you desire. I will sell these

pipes to you at 40 cents each or three for a dollar. Order now—know that if you are not entirely satisfied, your money will be returned cheerfully. This offer holds good for this time only. Send the Coupon now.

My handsome illustrated 1911 Smokers' Book sent FREE with every order.

H. MENGES
The Smoker's Friend
815 Menges Bldg.
ST. LOUIS
MO.

Claw is Design A, Calabash is Design B.
H. MENGES
815 Menges Bldg.
St. Louis, Mo.

Enclosed find 40 cents for one, \$1.00 for three of your Anti-Nicotine pipes. Please send Design A..... Design B..... (State how many of each design wanted.) It is understood that if I do not like the pipe or pipes I am to return the goods and receive my money back in full.

NAME

ADDRESS

TOWN

STATE

CUT
OUT
AND
MAIL
TODAY



**Wins
Every
Race!**

Flexible Flyer

**"The sled
that steers"**

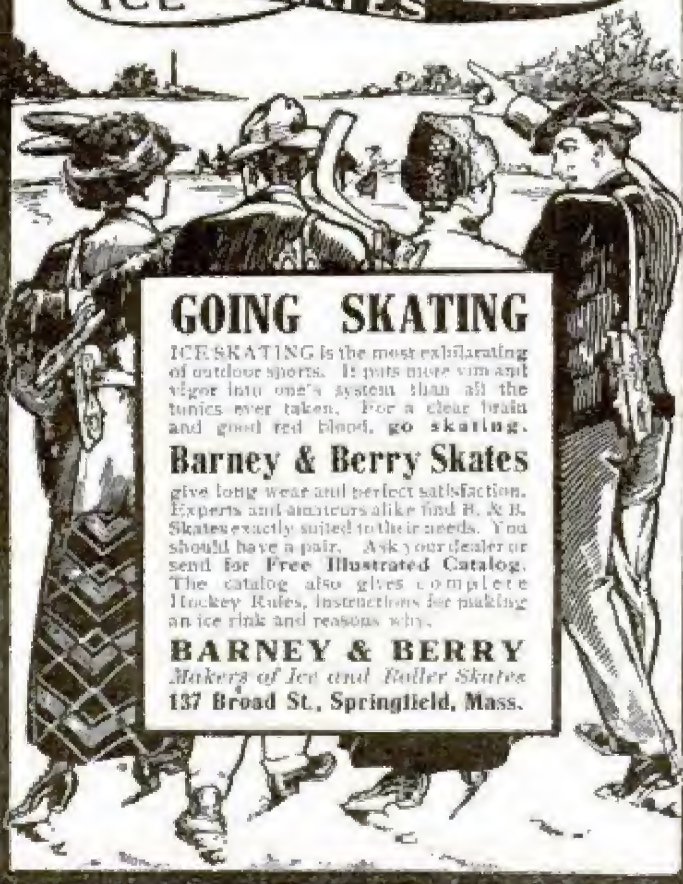
The ideal Christmas gift. Nothing will make the children so happy! Don't buy simply a "steering sled." Get a Flexible Flyer, the safest, speediest, handsomest and most economical sled made. Can be steered **at full speed** in any desired direction, **around** all obstacles and **past** other sleds. Has patented spring steel runners **grooved** to prevent "skidding." This is far superior to flat or rounded runners on ice or snow. It is light and graceful. Easy to pull up hill, yet so strong it **outlasts three ordinary sleds.**

Just the sled for boy or girl. Saves shoes, prevents wet feet, colds, etc., and saves doctor's bills. If you wish the advantage of these exclusive features insist on a Flexible Flyer and look for this trade-mark on the sled.

FREE a cardboard working model. Also beautiful booklet illustrated in colors showing coasting scenes, etc. Both free. Write a postal, giving your name and address, and say "send model and Booklet." Write today! **S. L. ALLEN & CO., Box 1101G, Philadelphia, Pa.**



BARNEY & BERRY ICE SKATES



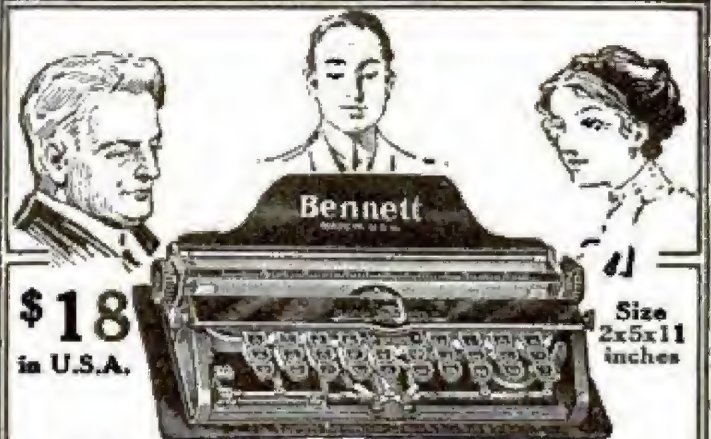
GOING SKATING

ICE SKATING is the most exhilarating of outdoor sports. It puts more vim and vigor into one's system than all the tonics ever taken. For a clear brain and good red blood, go skating.

Barney & Berry Skates

give long wear and perfect satisfaction. Experts and amateurs alike find B. & B. Skates exactly suited to their needs. You should have a pair. Ask your dealer or send for Free Illustrated Catalog. The catalog also gives complete Hockey Rules, instructions for making an ice rink and reasons why.

BARNEY & BERRY
Makers of Ice and Roller Skates
137 Broad St., Springfield, Mass.



\$18
in U.S.A.

Size
2x5x11
inches

The Most Wanted Gift

Decide right now to give the one you are most interested in a Bennett Typewriter for Christmas. It will delight the young man or young lady, encourage them to become business-like, and enable them to make spare time money, if they choose. It is just what the business man needs. He can't be up-to-date without a typewriter. He can carry the Bennett wherever business takes him. It slips into pocket or grip like a book. It will be of untold help to the woman who has considerable correspondence. No other gift you can buy for \$18 will be so genuinely appreciated as this easily carried, modern

Bennett Portable Typewriter

Gives \$100 quality of service—quick, accurate, time-saving—standard keyboard—built in the celebrated Elliott-Fisher Billing Machine Factory and guaranteed by them. Sold so cheaply because of a wonderful, unique and simplified construction.

Money Back If Not Satisfied

You take no risk whatever in making the gift of a Bennett. If recipient does not like it, return within 10 days and we'll refund your money. Write today for special Xmas offer and catalog.

P.M. BENNETT TYPEWRITER COMPANY, 366 Broadway, New York
A Few Capable Representatives Wanted
Foreign Address, 75 Cannon Street, London, E. C.

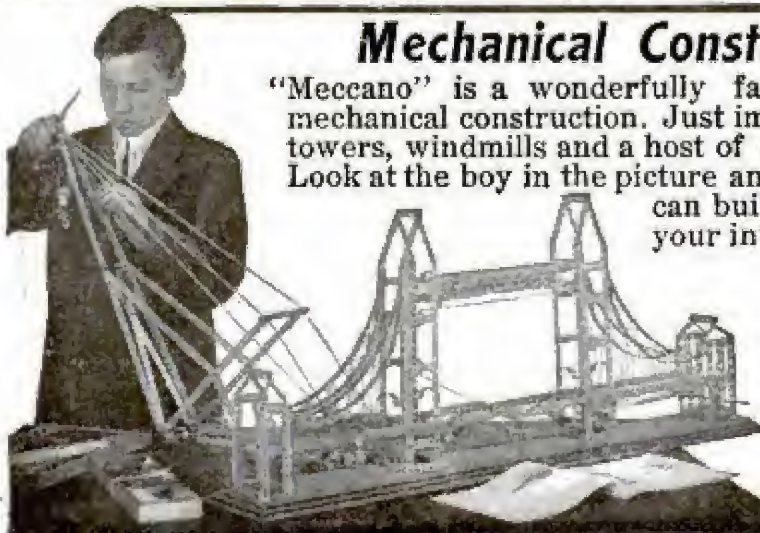
Mechanical Construction Taught by Play.

"Meccano" is a wonderfully fascinating game that actually teaches a boy mechanical construction. Just imagine building bridges, traveling cranes, signal towers, windmills and a host of other fine things that *work* just like real ones. Look at the boy in the picture and see the dandy tower bridge he has built. You can build the same and just as many other things as your inventiveness will permit.

"MECCANO"

comprises all the main mechanical parts used in machines—levers, beams, wheels, axles, pulleys, bolts, etc. Parts are made of nickel steel and brass and can be used over and over again. Every father should give this instructive toy to his son. Sold by leading toy and sporting goods dealers. Write for illustrated catalogue P.

THE EMBOSSEING COMPANY, Albany, N. Y.
Manufacturers of "Toys That Teach"



"17 Cents a Day"

The Plan That Promotes Success

THE "17-Cents-a-Day" Plan of purchasing The Oliver Typewriter means more than promoting sales of this wonderful writing machine.

This Plan is a positive and powerful factor in *promoting the success* of all who avail themselves of its benefits.

It means that this Company is giving *practical* assistance to earnest people everywhere by supplying them—for pennies—with the best typewriter in the world.

The "17-Cents-a-Day" Plan is directly in line with the present-day movement to substitute *typewriting* for *handwriting* in business correspondence.

Ownership of The Oliver Typewriter is fast becoming one of the essentials of success.

"17 Cents a Day" and The Printype —

OLIVER Typewriter

The Standard Visible Writer

There is no *patent* on the "17-Cents-a-Day" Purchase Plan.

We *invented* it and *presented* it to the public, with our compliments.

The "17-Cents-a-Day" Plan leaves *no excuse* for writing in *primitive longhand*. We have made it so easy to *own* The Oliver Typewriter that there's no need even to *rent* one.

Just say "17 Cents a Day"—*save your pennies*—and soon the machine is *yours*!

The Oliver Typewriter is selling by *thousands* for 17 Cents a Day.

When even the *School Children* are buying machines on this simple, practical Plan, don't you think it is *time* for *you* to get an Oliver Typewriter?

17 Cents a Day Buys Newest Model

We sell the new Oliver Typewriter No. 5 for 17 Cents a Day.

We *guarantee* our No. 5 to be *absolutely our best model*.

The same machine that the great corporations use.

Their *dollars* cannot buy a better machine than you can get for *pennies*.



The Oliver Typewriter No. 5 has many great conveniences not found on other machines.

We even supply it equipped to write the wonderful new PRINTYPE—for 17 Cents a Day.

Make the Machine Pay Its Cost

The Oliver Typewriter is a *money-making* machine. It helps "big business" pile up huge profits.

Tens of thousands of people rely on The Oliver Typewriter for their very *bread and butter*.

A small first payment puts the machine in your possession.

Then you can make it *earn the money* to meet the little payments.

If you are running a business of your own, use The Oliver Typewriter and make the business *grow*.

If you want to get a start in business, use The Oliver Typewriter as a *battering-ram* to *force your way in*!

The ability to operate The Oliver Typewriter is placing young people in good positions every day.

Get The Oliver Typewriter—on the "17-Cents-a-Day" Plan—it will help you win *success*.

Ask About "The Easy Way"

to secure the newest model Oliver Typewriter No. 5. The Art Catalog and full particulars of the "17-Cents-a-Day" Purchase Plan will be sent promptly on request. Address

THE OLIVER TYPEWRITER COMPANY

Agencies Everywhere

(143)

822 Oliver Typewriter Building, Chicago

Model Aeroplanes Make Desirable Christmas Gifts

OUR new improved No. 34 "BLERIOT" Racing Monoplane is the latest achievement in MODEL AEROPLANE construction, size 28x32 inches, double service motor, integral type propeller, planes adjustable, divertable rudder, beautifully finished and fitted with special aluminum parts, especially equipped with running gear, enabling model to ascend gracefully from the ground. This machine has a record of 356 ft. and is no doubt the finest model offered the public, every model guaranteed to fly and raise from the ground. Safe delivery assured. If you are interested in the greatest science of the age, AERONAUTICS, you should have our "BLERIOT" No. 34. SPECIAL offer during the Holidays—the above model sent by prepaid express on receipt of.....

\$5.00

Send Money Order. Personal checks must allow for exchange. ORDER TO-DAY.

Just the Engine for Model Aeroplanes



"NOMIE" 1/4 H. P., 3 Cylinder ROTARY ENGINE

The only MODEL AVIATION MOTOR in the world, that will successfully fly MODEL AEROPLANES. Motor develops a full 1/4 H.P. at 2,500 R.P.M., weighs 6 1/2 ozs., operates on Compressed Air, Carbonic Acid Gas, or Steam. Air Tube furnished with engine weighs 16 ozs., and contains 1.176 lbs. of air, tube can be exchanged for new charge for 15 cts. extra tubes 75 cts. each. The lightest and most powerful motor for its size in existence. Engine fully guaranteed for one year. Look out for imitations. "NOMIE" Engines are for sale by all leading MODEL SUPPLY houses or order direct from the sole manufacturers' agents. Price of Engine and Tank \$15.00 F.O.B. Chicago. Orders filled promptly.



Price List No. 5 just off the press. Send for it. No postals.

GOFF AEROPLANE COMPANY (Not Inc.) The largest and oldest manufacturers of MODEL AEROPLANES in America **219 S. Dearborn St., CHICAGO, ILL.**

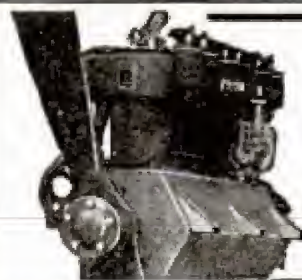


ing complete new line of Model Accessories; and our Bleriot, Antoinette, Wright, Nieuport and a guaranteed 1000 foot Racing in "Knocked Down" form and complete ready to fly Model.

THE WHITE AEROPLANE CO.
337 Adams St. BROOKLYN, N. Y.

AEROPLANES MODELS—SUPPLIES

Announcing our First Edition 1912 Catalogue S. Free on application. Listing complete new line of Model Accessories; and our Bleriot, Antoinette, Wright, Nieuport and a guaranteed 1000 foot Racing in "Knocked Down" form and complete ready to fly Model.



MAXIMOTOR

DEPENDABILITY THE AIM

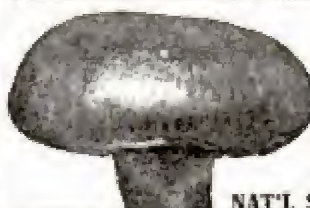
4 and 6 cyl. 30-75 h.p. 4 cycle. Surprisingly simple. Ask

CAUTION: PATENTED
DETROIT

67 CRANE
AVENUE

ORIGIN OF THREE CHEERS—We go back to Crusaders for the reason for the "cheers", or three chords sounded by the band before and after completion of the march down and back in front of troops at parade. The soldiers selected for a crusade were formed in line; the other soldiers not selected were lined up also, the two bodies being separated. The band then marched in front of those selected for service and back to its place, thus singling out and honoring those chosen to uphold the cause. The assembled populace no doubt cheered the selected soldiers, and the "three cheers" now given by the band were symbolic of the cheers for the Crusaders.—National Guard Magazine.

BE PROSPEROUS



Grow Mushrooms at home all winter in cellars, stables, sheds, boxes, etc. Large demand. \$20.00 a week easily made. Only small space necessary. We are large growers, make best spawn, and insure your success. Write for big booklet and learn how.

NAT'L SPAWN CO., Dept. 12, HYDE PARK, MASS.

Model Aeroplanes A Splendid Christmas Gift



"Ideal" Wright 3 ft. Bi-Plane Model

If HE is a man or boy interested in scientific or mechanical things, nothing will please him more for Christmas than a really scientific model aeroplane.

The "Ideal" Wright is the only three foot Bi-plane Model absolutely guaranteed to fly. Complete materials, ready to assemble, with plan and instructions \$6. (If prepaid, add 40 cents for express charges.) Plan and directions for building (no materials) 25 cents.

Complete materials, ready to assemble, of 3 foot Bleriot Monoplane \$3. (If prepaid, add 25 cts. for express charges.) Plan and directions for building (no materials) 15 cents.

We can furnish complete model aeroplane supplies of the highest quality. Our line includes everything needed for building scientific, practical models.

Send stamp for most complete Catalog published, containing illustrations and full descriptions.



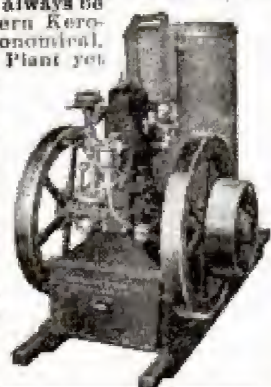
"Ideal" 3 ft. Bleriot Monoplane Model

IDEAL AEROPLANE & SUPPLY CO.
82-88 West Broadway NEW YORK CITY

POWER AT LOW COST Kerosene as Fuel

15 Days FREE Trial

HERE is Power for you that can always be relied upon. The Colton Modern Kerosene Engine is the most economical, simplest and most reliable Power Plant yet invented. Its many new improved patented features are most valuable and are not found on any other engine. Power is constant, speed regulated without stopping engine—adjusts itself instantly to any overload—no cranking to start it. Every Colton is sold under a positive, unqualified guarantee to give satisfactory service or money refunded. Our company has been established 27 years. Get it on trial and compare its simple, compact construction, superior quality materials and high grade workmanship. You will see it operate with less attention and furnishes more power per rating than any engine you ever saw. Send for Free Engine Book at once.



Arthur Colton Co., 182 Brush St. Detroit, Mich.



HANSEN'S GLOVES

"Built Like a Hand"—For All Kinds and Conditions of Service

DO you treat your hands well? They are *your fortune*; neglect of them is bad business, for men at work or play. For trade, profession or sport, Hansen's Gloves give the only *perfect protection* with full *liberty* of fingers and fist.

Hansen's Gloves are made of horsehide or pigskin leather, tanned by a special process, warranted not to shrink nor shrivel, harden, crack nor peel. Washing in gasoline leaves them soft, pliable and shapely as new.

MADE IN HUNDREDS OF STYLES and all sizes in various colors for automobilist and cyclist, hunter, farmer, miner, ironworker—you cannot name a field of play or work for which there is not a Hansen

Glove practically *made to order* but ready to wear.

They are "built like a hand" and built exactly to suit all lines of labor. They are economical, too. They cost no more and outlast the ordinary kind.

FREE BOOK: Fill out attached coupon, mail to us and receive free book describing and illustrating all styles. Or, write us a postal if more convenient.

O. C. HANSEN MFG. CO.
291 Milwaukee Ave. Milwaukee, Wis.

O. C. HANSEN MFG. CO.
291 Milwaukee Ave. Milwaukee, Wis.

Please send me your Free Book illustrating and describing your styles of gloves and mittens. I am most interested in the styles you make for the following purpose:



Hansen
"Glad Hand"
One of a hundred styles.

Name.....
Address.....
Town..... State..... 1933

SHARK FISHING FOR PROFIT—A new industry has sprung up in the Hawaiian Islands, where the sea that surrounds that region is almost alive with sharks.

Honolulu business men have formed a company for the purpose of producing oil from the sharks. It is said the oil, which is very strong and possesses a rather rank odor, can be so refined that it will have ready sale.

Shark oil contains certain medicinal properties something similar to the well-known codfish oil, and it is said that when it is deodorized it will go into general use.

The shark skins are also valuable for the making of a



4 Musical Instruments FREE

You get these marvelous attachments—superb harp, Tyrolean zither, concert guitar and artist banjo, **FREE** with every celebrated WING piano or player piano. You can play as well as the most accomplished specialized artist by pressing a pedal. We ship, prepaid, for four weeks Free Trial a WING with these unprecedented additions. Write today for big piano book and details of wonderful offer.

WING & SON, Dept. 1199, 9th Ave. and 13th St., NEW YORK CITY

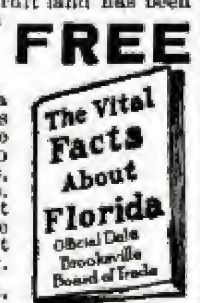
BROOKSVILLE, FLORIDA, BOARD OF TRADE

80 Bushel Corn Farms

also produce the best oranges and grape fruit. Truck farming equal to any in state of Florida. Only a small amount of Florida soil is rich, high, black hammock land such as surrounds our city. We, the Brooksville Board of Trade, have no land to sell, but want to interest ambitious men with from \$500 to \$1000 capital to help develop tremendous agricultural and industrial advantages of Brooksville and Hernando County. Although farm and fruit land has been steadily going up in price, some good land can still be bought far below its real value.

Send for Free Book

It tells you about the different kinds of Florida soil, and why the biggest corn crops (80 bushels per acre), best citrus fruits, truck and staple crops are grown here. 300 feet above sea—no swamps or marshes. Ideal climate—schools, churches, good roads, all modern conveniences. If you are not afraid of work and have at least \$500 to \$1000 capital, come to Brooksville. We need you and will help you by giving the benefit of our advice and experience. Write us today. BOARD of TRADE, Box 510 BROOKSVILLE, FLA.



A Card in Evidence

When the time comes for the use of a card, it is very essential that the card should be **right**.

A Peerless Patent Book Form Card

is **right**, when the time comes for the use of a card, no matter what the circumstance.

It is **always clean**, **always smooth**, **always there** in the case, and **always a source of pride** that it is always just the best card that money can buy or effort can produce.

No feature could be added to make it any better, else we would have done so long ago, when we made the first and original improvement in cards.

A sample tab of the cards, will give you the evidence when you detach the cards one by one, and note the smooth edges and the cleanliness that must be the result of the book in the case. Send for the tab, and see for yourself.

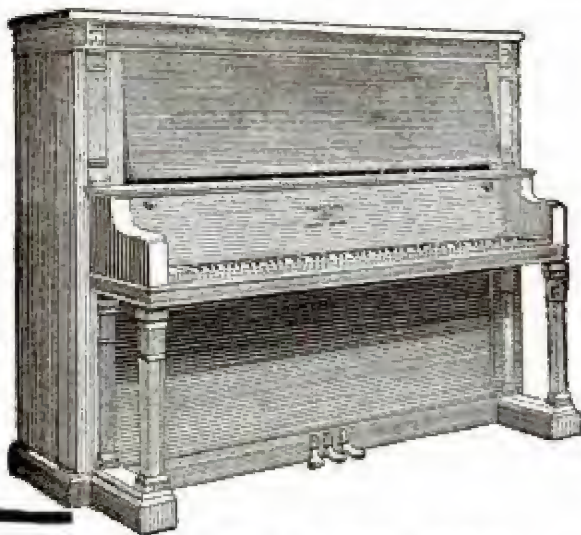
OUR SMART CARD IN CASE



The John B. Wiggins Company

Engravers Die Embossers Plate Printers

62-64 East Adams St., Chicago



The World Famous MEISTER PIANO

Sent to any home in America on
30 Days Free Trial

The Freight Prepaid

Eight artistic styles to choose
from ranging in price from

\$175 to \$350

Sold direct from the factory to you, and
not sold to dealers or commission men under
any circumstances.

If you like the instrument and desire to
keep it after the month's free trial, these are
the terms of sale:

SMALL WEEKLY or MONTHLY PAYMENTS
NO CASH PAYMENT DOWN
NO INTEREST ON PAYMENTS
NO EXTRAS OF ANY KIND
PIANO STOOL AND SCARF FREE

Sold under Rothschild & Company's Guar-
antee Bond, which is as good as a Gov-
ernment Bond.

Rothschild & Company's resources are in
excess of \$4,000,000, and every promise they
make is absolute. Ask any banker in America
for Rothschild & Company's commercial rating.

Send for our beautifully illustrated catalog
showing Meister pianos in the natural wood
colors. The book also contains hundreds of
testimonial letters from delighted customers.
A post card will bring it.

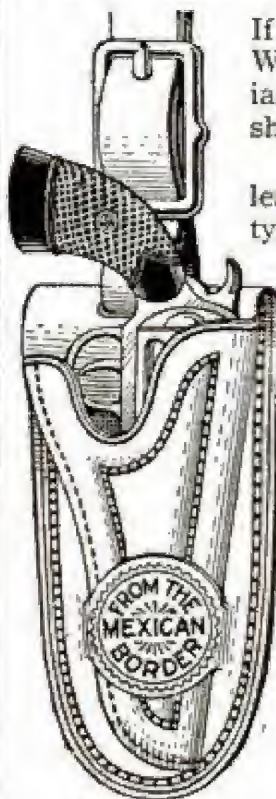
The Meister Piano Co.

(Rothschild & Company, Sole Owners)

Dept. 16 L

CHICAGO, ILL.

You Can Carry a Gun



If it is one of our novelty
WATCH FOBS. Perfect mini-
atures of the Cowboy's six-
shooter.

Metal gun inserted into
leather holster, like the picture,
typical of the gun-carrying
days of the West.

**A Novelty Worth
Having**

Now is the time to obtain
this splendid novelty, new
on the market. Sold by all
druggists, newsdealers,
tobacconists and novelty
stores.

Mail us twenty-five cents
(coin) and we will send you
one of these unique fobs by
return mail.

**Five for one dollar,
charges paid**

ALAMO LEATHER & NOVELTY CO.
Dept. P. M., 425 Avenue D SAN ANTONIO, TEXAS

kind of leather which has been found to be quite service-
able in many ways, and owing to the vast quantities of
these ugly fish it is thought the new industry will be a
success.—Philadelphia North American.



CLASS PINS AND
BADGES

For College, School, Society or Lodge.

Descriptive catalog with attractive prices
mailed free upon request. Either style of

pins here illustrated with any three letters and figures,
one or two colors of enamel. STERLING SILVER, 25c
each; \$2.50 doz.; SILVER PLATE, 10c each; \$1.00 doz
BASTIAN BROS. CO. Dept. 672 ROCHESTER, N. Y.



BENJAMIN AIR RIFLE
FOR MEN
AND
OLDER BOYS.

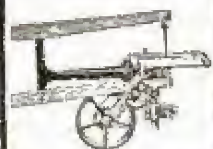
An air gun that will shoot through
one-half inch pine easily. Many times
more powerful than spring guns. Uses com-
pressed air, same as air brakes, rock drills, etc. 15c
pays for 1,000 shots (delivered 30 cents). Practical for small game.
37 inches long. Walnut stock. Nickel barrel. Takes down. Fully
Guaranteed. Sold by dealers everywhere. If your dealer does not
carry it, write us. Sent prepaid east of Rocky Mountains on receipt of
\$2.50. Pacific Coast and Parcel Post Countries \$3.00. Circular free.
BENJAMIN AIR RIFLE & MFG. CO., 2002 Frisco Bldg., ST. LOUIS, MO.

400 Plans for \$1.00
(and 25c for postage)



Are you going to
build? Send for our
latest designs of cot-
tages, bungalows,
single and double
houses, flats, etc.,
from \$300 to \$12,000.
Don't build until you
have seen them.

J. H. DAVERMAN & SON, Architects
5121 Murray Block GRAND RAPIDS, MICH.



JIG SAW



LATHE AND SAW



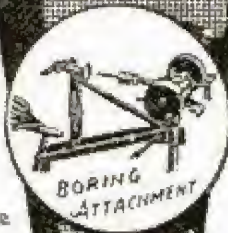
SKATE SHARPENER



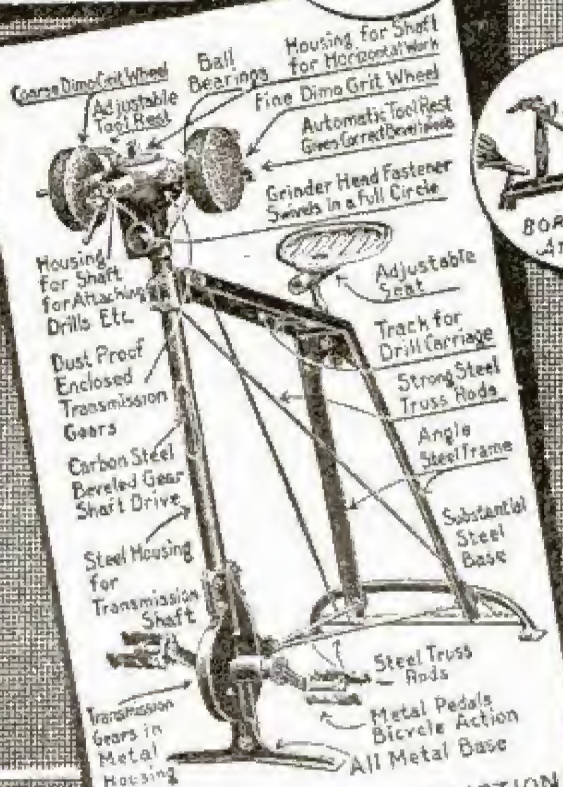
SURFACING IRON



POWER ATTACHMENT



BORING ATTACHMENT



MECHANICAL CONSTRUCTION


**30 Days'
Free Trial**

Luther Hummer Tool Grinder

**30 Days'
Free Trial**

A workshop in itself—does all kinds of sharpening, grinding, buffing and polishing, and can be used as a jig, rip, and cut-off saw, lathe, force feed drill, etc., 30 attachments—30 days' Free Trial.

DIMO-GRIT "THE WHEEL FOR STEEL"

10 times more efficient than emery. 25 times faster than the grindstone—will not draw temper. Dimo-Grit, the newest artificial diamond abrasive, cuts steel away in tiny shavings—no need of cooling with water—cuts hardest steel as emery does copper. Dimo-Grit is especially adapted for steel. On the wheels of the Luther Hummer, turning 4000 revolutions per minute, it makes any job of sharpening quick, easy work. Dimo-Grit wheels far outlast emery wheels. Carborundum wheels furnished if wanted. No other machine so moderate in price—saves money and makes work easy in so many different ways. It is a big economy and money-maker for any tool user, as you can prove by trying it 30 days free.

Easy Running Shaft Drive

The Hummer is all steel and iron construction, absolutely rigid, and without vibration. Has bevel gear shaft drive, ball bearings, gravity lubrication, etc. See illustration. Patent tool rests make it easy even for apprentices to sharpen twist drills, saw, chisels, etc.

**30 Days'
Free Trial**

Write today for our 30 days' Free Trial Offer. You will be under no obligations. We will also send you an interesting 40 page illustrated book, describing the Hummer, and containing McClure's Magazine's story of the discovery of artificial diamond abrasives. Write for free trial offer today.

Dimo - Grit Sharpening Stones

Ask your dealer for Dimo-Grit sharpening stones, the fastest stones especially suitable for steel. Look for the name "Dimo-Grit"

Luther Grinder Mfg. Co., 209 Stroh Bldg., Milwaukee, Wis.



PATENT YOUR IDEAS

*—There is a Constant Demand
for Good Inventions*

Thousands of the biggest money-making inventions have been the "little" things that have made people wonder why they were never thought of before.

"WHAT TO INVENT"

and

"HOW TO OBTAIN A PATENT"

These Books Sent Free

If you have an invention send us a sketch, photograph or model of it. We will give you a report as to its patentability absolutely free. If you have no invention send for our book, "What to Invent." It contains hundreds of valuable suggestions.

We are recognized authorities on patent matters and have helped hundreds to find a ready and profitable market for their ideas. We can prove it. If you wish to sell your patent we will advertise it in manufacturers' journals at our expense.

Don't Wait—Find Out NOW!

Your idea will never do you any good if someone else patents it ahead of you. Act quick! Let the other fellow say "he thought of it a long time ago." You reap the profit. Let the others wish they had.

Advice Free—All Matters Confidential

We have secured patents for thousands of inventors and have many letters proving the value of our services. Write us. Send rough drawing or model of your invention for our opinion. We will guard it carefully and report quickly. You are under no obligations to proceed further. Our plan is simply a square deal to all. Our books, "What to Invent" and "How to Obtain a Patent" are the best publications written for the man who has an idea to patent, or who is of an inventive turn of mind. They show just how to proceed with your idea and tell of hundreds of things to invent. We gladly send these books free. The sooner you write for them the sooner you will know all about patents and the many different lines in which new inventions or improvements may be made.

*If you have an invention send us a sketch of it for
report and ask for the books at the same time.*

CHANDLEE & CHANDLEE, 984 F Street, Washington, D. C.

REGISTERED ATTORNEYS

(Combined with H. Ellis Chandlee & Co.)

PATENTS TRADEMARKS AND COPYRIGHTS SECURED OR FEE RETURNED

SPECIAL OFFER — FREE SEARCH OF PATENT OFFICE RECORDS

Send us a model, photograph or sketch and description of your invention, and we will make a *Free Search* of the *Patent Office Records* to ascertain if it is patentable. If we report the invention patentable, we will guarantee to obtain a patent or return our fee, and furnish a certificate of patentability backed by a bonded contract to that effect.

This Certificate of Patentability will protect the inventor and serve as proof of the invention until the case can be filed in the U. S. Patent Office.

OBTAINING ASSISTANCE FOR INVENTORS

Our certificate is of great assistance to inventors who require financial aid to obtain patents. It is useless to attempt to interest capital unless evidence is furnished that the invention is patentable. Our certificate gives this necessary assurance.

OUR FOUR BOOKS MAILED FREE

to any address. Send for these books—the finest publications ever issued for free distribution.

HOW TO OBTAIN A PATENT

Our illustrated eighty-page Guide Book is an invaluable book of reference for inventors, and contains 100 mechanical movements illustrated and described.

FORTUNES IN PATENTS

Tells how to invent for profit, and gives history of successful inventions.

WHAT TO INVENT

Contains a valuable LIST OF INVENTIONS WANTED and suggestions concerning profitable fields of invention; also information regarding prizes offered for inventions, among which is

PRIZE OF ONE MILLION DOLLARS

offered for one invention, and \$10,000 for others.

PATENTS THAT PAY

Contains fac-similes of unsolicited letters from our clients who have built up profitable enterprises founded upon patents procured by us; also indorsements from prominent inventors, manufacturers, Senators, Congressmen, Governors, etc.



VICTOR BUILDING

Our new \$150,000 building, opposite the U. S. Patent Office, specially erected by us for our own use, designed and equipped with all modern appliances for our patent business.

WE ADVERTISE OUR CLIENTS' INVENTIONS FREE

in a list of Sunday newspapers with two million circulation, in manufacturers' journals and in the *World's Progress*. Sample Copy Free. We also send a LIST OF PATENT BUYERS. We not only save you time and money in securing patents, but obtain patents which PROTECT the invention and PAY. After the patent is granted we assist you TO SELL YOUR PATENT.

FOREIGN PATENTS

WE HAVE DIRECT AGENCIES IN ALL THE PRINCIPAL FOREIGN COUNTRIES and can secure FOREIGN PATENTS in the shortest possible TIME and at the LOWEST COST. We GUARANTEE TO SECURE THE FOREIGN PATENTS OR RETURN OUR FEES. Write for our Illustrated Guide Book on Foreign Patents, sent free to any address.

REFERENCES:

Second National Bank, Washington, D. C.
R. G. Dun & Co., Washington, D. C.
National Savings and Trust Co., Washington, D. C.
Smethport Glass Co., Smethport, Pa.
Schrade Cutlery Co., Walden, N. Y.
Clum & Atkinson, Brass Founders, Rochester, N. Y.
Rochester Rotary Pump Co., Rochester, N. Y.
Lawrence Mills, Mfrs. Bed Spreads, 51 Brooke Ave., Englewood, N. J.
The Melvin Gauge and Signal Inst. Co., Scranton, Pa.
Damon Mfg. Co., Mfrs. "Missing Link" Flour Mill Disintegrators, Bowling Green, Ky.
Modern Canner Co., Mfrs. Canning Machinery and Canners' Supplies, Bridgeport, Ala.
M. Winter Lumber Co., Sheboygan, Wis.

C. K. Lassiter, Mechanical Engineer, Schenectady, N. Y.
Pitner Gasoline Lighting Co., Chicago, Ill.
Sprout, Warden & Co., Mfrs. of the Monarch Feed Governor, Muncy, Pa.
The L. B. Dozier Co., Mfrs. of Plumbing, Heating and Machinery Supplies, Columbia, S. C.
B. B. Earnshaw & Bro., Mfrs. "Cream Blend" Flour, Washington, D. C.
A. L. Schultz, Consulting Engineer, Pittsburgh, Pa.
Arthur H. Swan & Co., Mfrs. of Peel-Blade Tips, 279 Warren St., Roxbury, Pa.
The H. W. Moore Piano Truck Co., Anderson, Ind.
The Culver Novelty Co., Mfrs. of Carbureters and Mixers, Culver, Ind.

VICTOR J. EVANS & CO., VICTOR BUILDING
(Formerly EVANS, WILKENS & CO.) 724-726 9th St., N. W.
Opposite United States Patent Office WASHINGTON, D. C.

PATENTS THAT PAY

"My Trade-Mark"

Special Offer:

Mr. Inventor: I invite you to come to see me, and bring, (or send by registered mail), sketches or photograph or model and description of your idea or invention for FREE examination of U. S. PATENT OFFICE Records and report as to patentability of the same;—to find out as to whether you are entitled to a patent will not cost anything;—then, if your invention is new, upon receiving instructions, I will prepare ALL necessary (application) papers.

DO THIS AND SAVE TIME AND MONEY!

WRITE NOW!

Highest References:

Lincoln National Bank,
Washington, D. C.

NOTE: When writing these clients send two-cent stamp for reply.

Little Giant Hay Press Co.,
Alma, Mich., and
Dallas, Texas.

American Railway
Appliance Co.,
Oil City, Pa.

Farmers' Mfg. Co.,
Norfolk, Va.

Anderson Mfg. Co.,
Tulsa, Okla.

Griffin Mfg. Co.,
New York, N. Y.

Warsaw Paper Box Co.,
Warsaw, N. Y.

Sanford Mfg. Co.,
Sanford, N. C.

Butler Engineering Co.,
Akron, Ohio

Thompson Drug Co.,
Sioux City, Iowa

Garl Electric Co.,
Akron, Ohio

Gray Lithograph Co.,
New York, N. Y.

Iowa Mfg. Co.,
Oskaloosa, Iowa

New Era Mfg. Co.,
Fairfield, Iowa.

Bernhard Furst,
Vienna I,
Austria-Hungary

A. J. Corsi,
Irish Town,
Gibraltar

Otto von Rottenburg,
Schwindstrasse 20,
Frankfort A/M,
Germany

H. A. Fonseca,
Ries Dos Ourives 20,
Sobrado, Rio de Janeiro,
Brazil

Electro Importing Co.,
New York, N. Y.

Rex Electric Co.,
St. Louis, Mo.

Sam'l Allen & Son Mfg. Co.,
Danville, N. Y.

Smith-Evenson
Electrical Co.,
Seattle, Wash.

Camp Conduit Company,
Cleveland, Ohio

INFRINGEMENT, VALIDITY AND INTERFERENCE WORK SOLICITED

I am admitted to practice before the United States Supreme Court and others

"I want to thank you for the most excellent services you have rendered me in this suit [B. Williams vs. Central Drug Co., U. S. C. C., Northern District of Illinois—E. Div.], and assure you that I appreciate it very much, and if at any time I can secure some business for you, I will be only too glad to do so."

(Signed) J. THOMPSON, Mgr. Central Drug Co., Sioux City, Iowa.

Other Important Suits Successfully Settled

Instructive 100-page Guide Book for Inventors mailed to any address upon request

Foreign Patents a Specialty

If you have a U. S. application write me for excellent literature and terms for promoting your Foreign Patents. Liberal discounts.

I Advertise My Clients' Patents Free

in a publication having over 2,000,000 circulation. Write for Special Offer. Successful clients in every section of the U. S.

COMPARE MY LOCATION WITH OTHERS
MINE IS THE BEST

E. E. VROOMAN



My Office and the Patent Office
(I give you proof of my location)

Across the street from the U. S. Patent Office

Expert—Prompt Services

High-Class Work—Excellent Testimonials

871 F Street, N. W.

E. E. VROOMAN, Patent Lawyer Wash., D. C.

Registered Patent Attorney. Patent Litigation

\$343,840.00 \$
MADE BY MY CLIENTS

YOU Should Have My FREE GUIDE BOOK

Containing hundreds of testimonials, showing the kind of services rendered my clients.

"I received ONE HUNDRED DOLLARS (\$100.00) down (in re my 'Can Righting Machine' inventions) and in thirty days NINE HUNDRED DOLLARS (\$900.00), and when my patents are issued ONE THOUSAND DOLLARS (\$1000.00) more. I can conscientiously state to my fellow inventor that he will do the right thing by placing his patent business in Mr. Vrooman's hands for the best iron-clad patents."

(Signed) WILLIAM C. BRIDGES, Wapello, Iowa.

PATENTS THAT PROTECT and PAY

Advice free. Terms reasonable. Highest references. Best results.

Send sketch or model for FREE examination and opinion.

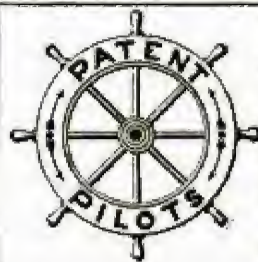
Recommended Patent Lawyer in the Bankers' Register and special list of selected lawyers.

Also in Martindale's Law Directory, Sharp and Alleman's Directory of Lawyers, The
Gast-Paul Directory of Lawyers, and Kime's International Law Directory.

ALL BUSINESS GIVEN PROMPT AND PROPER ATTENTION

A large list of strong recommendations furnished free

WATSON E. COLEMAN, Patent Lawyer, 622 F St., N.W., Washington, D.C.



Patent Your Ideas—It Pays

"WE GUIDE YOU TO SUCCESS"

25 years' experience as Attorney and U. S. Patent Examiner. Send sketch of invention for Free report and Illustrated Guide Book. **No Patent—No Charge.** We succeed where others fail.

BUNYEA PATENTS CO.
Room 27 WASHINGTON, D. C.

One Inventor gets rich; another gets nothing. New 128 p. book of Vital Advice, Great Value and Intense Interest to Inventors, tells why, About Prizes, Rewards, Etc. Fortune-Making Inventions Past and Future. Mailed for 8 cents postage.
Publishers PATENT SENSE, Dept. 45, Barrister Bldg., Washington, D. C.

ORIGIN OF THE SALUTE—Why does a soldier, when saluting a superior, raise his hand to his head covering? The beginning dates back to the time of the Borgias, if not to an earlier date. In those days assassination was in vogue, and, in order that an inferior might not have a superior at advantage, the inferior was compelled, when coming into his superior's presence, to raise his right hand, palm to the front, to show that no danger was concealed there. From this old-time cus-

PATENTS INVENTORS OF WIDE EXPERIENCE

employ my method in securing patents. So will you eventually. Why wait? Just send for my book. *Every client secured becomes a client for life.*

WM. T. JONES, 803 G St., Washington, D. C.

PATENTS

C. L. PARKER
Ex-Examiner U. S. Patent Office
PATENT LAWYER
210 MCGILL BLDG.
WASHINGTON, D. C.

Patents, Trade Marks, Copyrights, Patent Litigation

Handbook for Inventors, "Protecting, Exploiting and Selling Inventions" sent free upon request.

WANTED-IDEAS

Manufacturers are constantly writing me for new ideas protected by **OWEN PATENTS.** Send for my free literature and read their wants.

FREE! Three finest patent books published! 72 page guide, "Successful Patents;" "Stepping Stones" (containing list of over 200 inventions wanted; about prizes, reward offers, etc.); and "Patent Promotion" (tells how to sell your rights, chief causes of failure, etc.). All sent free upon request.

Very highest references. My personal services. I help my clients sell their patents or dispose of their applications. Advice free. No obligation incurred by writing me. Free manufacturing facilities. I secure patent or no fees. No charge for report as to patentability, practicability, etc.

RICHARD B. OWEN
9 Owen Building WASHINGTON, D. C.

LANGDON MOORE

Counselor-at-Law and Patent Attorney
**Patents, Trade-Marks
Designs and Copyrights**
9th and F Streets, WASHINGTON, D. C.
Formerly Examiner U. S. Patent Office
SEND FOR BOOKLET

A Patent of Quality

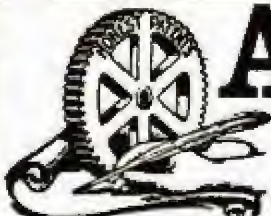
is the only kind that will protect your invention and make it salable. You need my free advisory information. Send for it.

GEO. R. HAMLIN, Patent Lawyer
801-8th Street, N. W. WASHINGTON, D. C.

PATENTS BUILD FORTUNES FOR YOU

Our free booklets tell how, what to invent, How To CHOOSE AN ATTORNEY, and save you money.

Prosperous clients in all states. Best bank and other references. **WRITE TODAY**
D. SWIFT & CO., 317 SEVENTH ST., WASHINGTON D. C.



A Talk to the Inventor

LEARN HOW A PATENT MAY BE MADE VALUABLE

If there is any basis for an application in your idea, I can find it. But I will explain it to you before filing your application. Copies of Nearest Patents, and Report, in Every Case I have patented inventions reported unpatentable elsewhere

Send for **FREE BOOK** What You Should Know
What to Invent
What NOT to Invent
How to Sell Your Patent
WASHINGTON, D. C.

H. L. WOODWARD, 9th and G Sts., Opposite Patent Office,

Send For Our Free Vibrator Book



If you send your name and address we will send you **Free** our Vibrator Book describing the White Cross Electric Vibrator shown here.

Merely send a Postal Card and our FREE Vibrator Book will be mailed to you.

This Vibrator is a rubbing machine which draws the blood to any aching part of the body to do its work. This machine rubs much better and much faster than the hands.

While the hands are able to give a few dozen rubs per minute the machine gives several thousand rubs. It rubs hard or gently, just as the operator chooses. The machine can be operated by anyone in his own home.

*Send today for the
FREE VIBRATOR BOOK*

Lindstrom-Smith Co.
218 S. Wabash Ave., Dept. 1199
CHICAGO

Rémoh Gems

Not Imitations

A marvelously reconstructed gem—the greatest triumph of the electric furnace. Looks like a diamond—wears like a diamond—will cut glass—stands filing, fire and acid tests like a diamond—guaranteed to contain no glass. Rémoh Gems have no paste, foil or artificial backing—their brilliancy is guaranteed forever. One-thirtieth the cost of a diamond. These remarkable gems are set only in 14 Karat Solid Gold Mountings. Sent on approval—your money cheerfully refunded if not perfectly satisfactory. It will be well worth your while to get our De-Luxe Jewel Book—yours for the asking. Cut out and mail the coupon below—or write a postal. Address

Remoh Jewelry Co.
429 N. Broadway, St. Louis, Mo.

Remoh Jewelry Co.,
429 N. Broadway, St. Louis, Mo.
Send your De-Luxe Jewel Book.

Name

Address

City

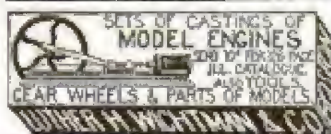
State

**Sign
And
Mail This
Coupon Today**

Please Mention Popular Mechanics

tom our hand salute has come down.

The salute with the sword was not done that way in the beginning without any reason. When Knights of the Crusaders received their orders it was the custom for them to call upon God to witness their assumption of the orders given. To do this the sword was raised to



**MECHANICAL
SUPPLIES AND MATERIAL**
of all kinds,
EXPERIMENTAL AND
LIGHT MACHINE WORK
to order.
132 MILK STREET, BOSTON

**DIES, FINE TOOLS
METAL SPECIALTIES**
MOORE & CO., 391 W. Indiana Street
CHICAGO

**SPECIAL
MACHINERY.
INVENTIONS
PERFECTED.**

**Let Us Do Your
Manufacturing**

Buying material in large quantities and having a modern factory equipped with the latest machinery enable us to make almost anything in metal or wood at a very low price. Estimates free. We have a complete model and pattern department.

TINLEY PARK MFG. CO., 222 N. State Street, CHICAGO

Active Powers of Inventive Genius



INVENTORS Our Brain Belongs to You. Our Ideas Are Free of Charge.

All we want in return is to build your model, special machinery, dies, tools and jigs to manufacture sheet metal goods, etc. We are expert mechanics, over thirty years experience and have one of the best equipped shops in the country. Ask for Booklet No. 17. Consultation free. Experimental work strictly confidential.

A. NACKE & SON

236-242 S. 9th St., Philadelphia, Pa.

DON'T DISCARD BROKEN PARTS

Have them welded together by the Oxy-Acetylene Process. Steel, Cast Iron, Bronze, Copper, Aluminum and all other metals can be welded. Manufacturing quoted on. Welding equipments for repair shops or large plants supplied.

DAVIS BOURNONVILLE CO.
105 West Street NEW YORK, N. Y.



LET THE RED DEVIL WATER MOTOR DO YOUR WORK

6-inch Motor

Improved construction, absolutely perfect, runs your washing machine and a hundred other things. Power for small tools. $\frac{1}{4}$ horse power on $\frac{1}{2}$ -inch pipe, 80 pounds pressure; 1 horse power on 2-inch pipe, 60 pounds pressure. New net price, \$5.00 cash with order.

No. 1492 4-inch Motors for grinding, polishing and buffing. Runs sewing machines, fans, bottle washers, etc. Price with emery, buffing wheel, silver polish and pulley, \$3.00. No. 1493 Motor and pulley only, \$2.50. $\frac{1}{8}$ horse power on 80 pounds pressure. Improved construction. Speeds, 3,000 to 5,000 revolutions per minute. Only scientifically and mechanically perfect small water motor manufactured. Patented construction makes it possible. Tremendous output warrants the price. Money back for any reason.

CATALOGUE AND LARGE SHEET FREE

DIVINE WATER MOTOR CO.

Dept. T UTICA, NEW YORK, U.S.A.

For the name of your local hardware or tool dealer, we will send you free booklet on "Theory and Design of Water Motors."



6-Inch
Bucket
Wheel

the front so that the hilt reached the lips, when the cross formed by hilt and blade could be kissed and an oath registered to carry out the orders faithfully. The dropping of the sword point to the front, indicates submission.—National Guard Magazine.

500—1-4 H. P. Motors \$20.00 each

Just the thing to run lathes up to 12 inches, drills, hacksaws, buffers, grinders, horse clippers, organs, etc. These motors are for electric lighting circuits only for alternating and direct current 110 volts. Several hundred other Dynamos and Motors.

GEORGE BENDER

82-84 Centre St., NEW YORK

BULL-DOG RATCHET DIE STOCKS

fine for close corners

1/8" TO 4" PIPE

THE OSTER MFG. CO.

CLEVELAND, OHIO.



VACUUM PUMPS

For Powerful Portable and Stationary Vacuum Cleaning Plants. They take up their own wear. Powerful; Noiseless; can't get out of order.

GET CATALOG No. 23

LEIMAN BROS., 62P John St., NEW YORK

"IDEAL" Lawn Mower Grinder

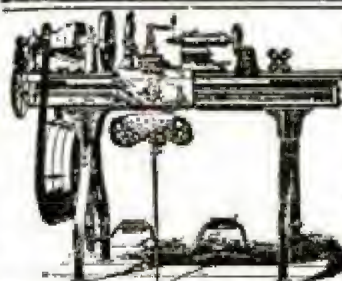


Grinds all makes of Mowers perfectly in 15 minutes without removing wheels or reel-knife. Ball-bearing; operated by either hand or power. Skate Sharpener Attachment for sharpening skates.

"You Grind It As You Find It."

WRITE TODAY for full information of this great labor-saver and money-maker. Will do the work so much better, quicker and easier you cannot afford to do without it. 1912 Model will grind straight-blade without removing from mower. Over 5000 in use. Fully warranted. Sold on easy-payment terms. Write to-day. Don't delay.

HEATH FDRY. & MFG. CO., Plymouth, Ohio



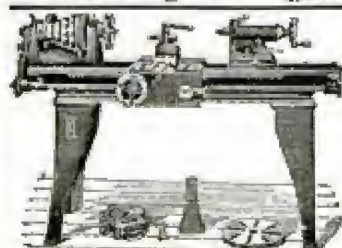
LATHES

9 to 13-inch Swing

List price \$75 and up according to size. When ready to buy send for Lathe Catalog and prices.

W. F. & John Barnes Co.

100 Ruby Street, ROCKFORD, ILL.



LATHES

\$75 Screw Cutting Foot or Power 9 to 13 inch

—CATALOG FREE—

SOUTH BEND MACHINE TOOL CO., 423 Madison St., South Bend, Ind.

LET THE "MULTIMOTOR" RUN YOUR SHOP!

Every Mechanic, Carpenter, Contractor, Repairman, Blacksmith, Home Owner needs this midget engine. Runs hand-power or tread-power machines perfectly. Speed 500 to 600 revolutions per minute—adjustable. Weight 250 lbs. Self-governing.



Runs for Less than One Cent an Hour

Saves time, money, muscle. **BOOK FREE!** Send today. Also Farm Pump Engines and high-powered engines. Dealer's name on request. Address

FULLER & JOHNSON MFG. CO., 12 Partridge Street, Madison, Wis. Est. 1840

"Norton" Water Motors Lead Them All

"Model B," for grinding, polishing, \$3.50

running fans, etc. "Norton Improved" with Patented combination shift gear, for flat or \$6.50

round belt Very powerful. Catalogue sent upon request

NORTON WATER MOTOR CO., Roslindale, Mass.



Pat. March 28, 1911

J. B. Norton

Files That Stand the Test

Many an ordinary file becomes useless in a very little while. After being used several times the teeth have lost their sharpness—the cutting edge is gone—the file is worthless. Now the safe way to buy a file is to ask your dealer for

Gold ★ Medal Files and Rasps

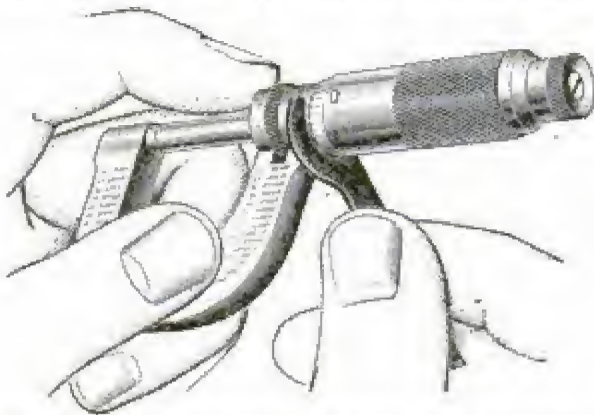
Then you are sure of getting the finest file manufactured. Every one is made of a *superior grade of crucible steel*, cut on the latest improved machinery by expert workmen and tempered by our secret chemical process that produces the finest temper known. The result is what every mechanic knows as

"The File that Files"

Remember the name—Liveright—and look for the star. If not at your dealer's, write us direct.

LIVERIGHT BROTHERS (Not in the Trust) **Philadelphia, Pa.**

The Simple Adjustment of The Starrett Micrometers



is a feature that enthruses all mechanics. It takes up any wear quickly and accurately—not by the trial, hit-and-miss way of the movable anvil. This is obtained by placing over the barrel a thin, graduated sleeve, which carries the base or zero line, instead of having it marked on the barrel itself. If at any time, on account of excessive wear, the zero line is not correct, a small turn of this sleeve with a small spanner wrench will remedy the error. Wrench is sent with micrometer.

SEND FOR CATALOG 19 A P

It shows cuts and gives valuable information about Starrett Combination Squares, Steel Rules, Tapes, Calipers, Hack Saws, Automobile Wrenches and many other fine tools.



**THE L. S. STARRETT
COMPANY**
ATHOL, MASS., U.S.A.



LUFKIN

Measuring Tapes

Standards of efficiency for the Amateur and the Expert. The big improvement in markings, instantaneous readings, saves time and avoids error. Send for sample piece of tape and our complete catalogue.

THE LUFKIN RULE CO.
SAGINAW, MICH.
New York London, Eng. Windsor, Can.



ACUTE SMELLING—Men are more sensitive to odors than women. Scientific tests have shown, I believe, that, while many men can detect the smell of prussic acid even when there is only one part of the acid to two million parts of water, the average woman fails to detect the smell if there are less than ten parts of the acid.

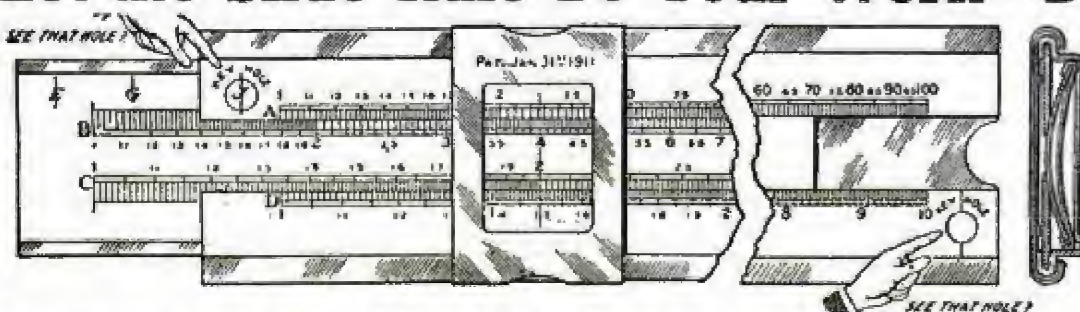
Though the white man is much less sensitive to odors than the savage, a prolonged stay in a part of the world where smells are few puts a very fine edge on the sense of smell. Dr. Nansen has declared that, when returning from the ice world to Franz Josef Land, he knew when

For Sewing Leather



\$1.00 A perfect stitcher. Sews or mends anything. Whole repair shop. Original perfect lock stitch. Diamond point grooved needle protects thread. Always ready. Sample prepaid. Agents get busy. Sells on sight. **C. A. MYERS CO., 6339 Lexington Ave., Chicago, Ill., U. S. A.**

Let the Slide Rule Do Your Work—Do Your Work



Engineers, Electricians, Draftsmen, Superintendents, Managers, Master Mechanics, Estimators and Business Men:

Your Time is too valuable to waste in solving problems or checking over the work of others the old way. The Richardson Slide Rule will do it mechanically. One of the most valuable instruments ever offered to mankind is the Slide Rule. Not until the above rule was designed did it become possible for a person of a limited education to learn to operate it.

Besides, the usual price has been reduced one-half, and the free instruction book is "written so you can understand it." This Slide Rule will multiply, divide, solve proportion, extract the square and cube roots, find the decimal equivalent of vulgar fractions or 'vice versa,' calculate interest, percentage. In addition to above the rule is direct reading for forty-four other problems, such as the Horse Power of Engines, Pumps, Boilers, Belts, Water Falls; size of motor to run a pump; size of duct for ventilating; percentage a recording wattmeter is "Slow" or "Fast"; radiation and size grate, and steam main required; change gear and pulley problems; areas, circumference and diameter of circles. You simply place the key to the problem in the key hole (the key is printed in red) and answer is given direct. This rule is my latest improved type now being placed upon the market for the first time. "See sectional cut," curved slide bound with aluminum. No other like it. Price \$2.50 with substantial pocket case and instruction book. Stock aluminum 11x1 5-8 inches with runner. Scales celluloid printed and polished in two colors and washable. It will make up your pay roll accounts. Calculates discounts off list price. For a Christmas present it has no equal.

GEO. W. RICHARDSON, Mechanical and Electrical Engineer, Ex. Chief Electrician, U. S. Navy, 4218-24th Place, CHICAGO, ILL.

The Best Gift for Any Man IS A "YANKEE" Tool



POCKET DRIVER No. 60

Three inches closed—Nickel-plated and polished—very attractive. Four blades carried in handle—Fits the hand—Fits the pocket—Fits the screws—Fit for any man.

MAGAZINE DRIVER No. 65

Four slip blades change it instantly to fit most any screw. Strong and compact. A very handy driver for any mechanic. Saves the price of several tools. (95c Postpaid)



HAND DRILL No. 1530

Has the same unique ratchet movement used in our popular Breast Drills, changing it instantly from a plain drill to a double ratchet where any movement of the crank forward or backward causes the drill to cut continually. A great convenience when working at close quarters. Takes round shank drills 3-16" and smaller. Drill points carried in the handle. (2.70 Postpaid)

Send for Tool Book (Free)

TELLS ABOUT 35 STYLES 85 SIZES

Your dealer sells the "YANKEE."

NORTH BROS. MFG. CO.
Station Q PHILADELPHIA, PA.

he was approaching the assistant he had left there, by smelling his scented soap, long before he saw him. He could, too, when approaching the hut, have given an inventory of the stores there, as he smelt everything it contained, separately and distinctly.—Philadelphia Inquirer.

Christiansen's Steel Screw Vise

is the handiest ever out. It can be attached to a plank or a heavy table top in 5 minutes.



Price is only **\$2.00**

C. CHRISTIANSEN, 2219 Grand Ave., CHICAGO, ILL.

Ask about our \$,000 R. D. Tools

"Red Devil" Glass Cutters

"It's all in the wheel"

For 3 2c. stamps we will send any glazier 1 No. 024 Glass Cutter.

SMITH & HEMENWAY CO.
150 - 152 Chambers Street, New York, N. Y., U. S. A.

REG. U. S.
PAT. OFF.



You Can Trust
The MARK of
the MAKER on
P. S. & W.
Hand Tools



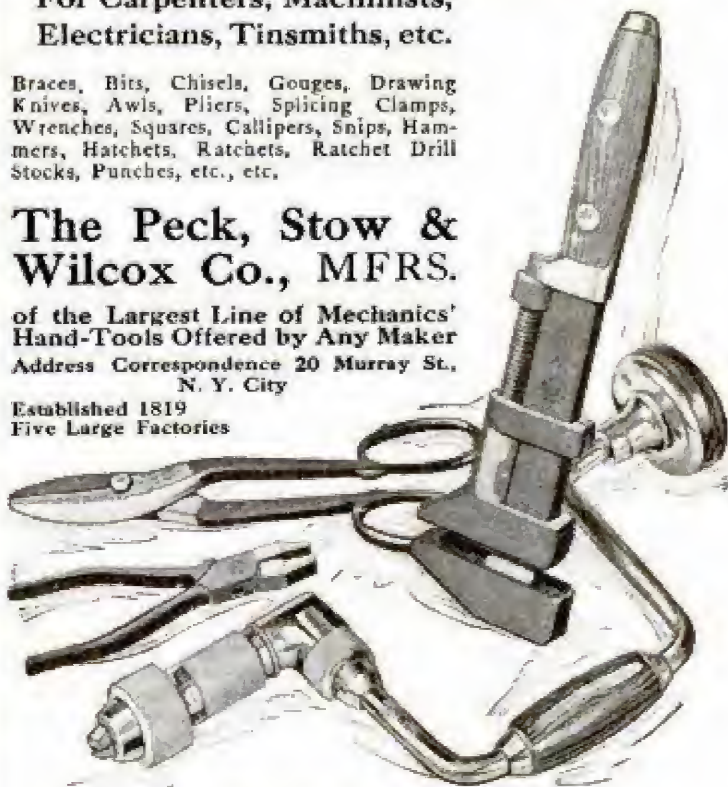
92 years of tool-making experience, reputation and progressive excellence are stamped with that mark on every guaranteed item in our

Four Large Lines of Hand-Tools
For Carpenters, Machinists,
Electricians, Tinsmiths, etc.

Braces, Bits, Chisels, Gouges, Drawing Knives, Awns, Pliers, Splicing Clamps, Wrenches, Squares, Callipers, Snips, Hammers, Hatchets, Ratchets, Ratchet Drill Stocks, Punches, etc., etc.

The Peck, Stow & Wilcox Co., MFRS.

of the Largest Line of Mechanics' Hand-Tools Offered by Any Maker
Address Correspondence 20 Murray St., N. Y. City
Established 1819
Five Large Factories

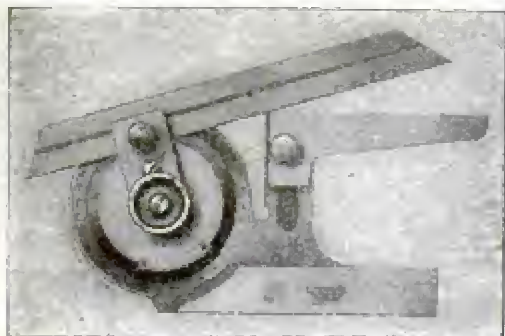


170 Pages of
Valuable
Information
Free to All
Tool Users

Reference tables for every day use and a catalog of over 200 tools that you can trust—because you know who makes them.

Please Mention Popular Mechanics

**A NEW TOOL FOR MEASURING
ESPECIALLY SMALL ANGLES**



**B & S Universal
Bevel Protractor**

With Acute Angle Attachment

This tool was designed to greatly increase the scope of the regular Improved Universal Bevel Protractor.

By means of the attachment especially small angles can be measured. In order that the greatest accuracy may be secured a fine adjustment is provided.

Send for "Up-to-Date Tools for Up-to-Date Men"

BROWN & SHARPE MFG. CO.
PROVIDENCE, R. I., U. S. A.

will cut with every stroke and that will "stay with you"—Then you want a

★ Star Hack Saw Blade ★

★ Star Blades ★ besides surpassing all other blades in quality and length of service, eliminate carrying a stock of blades of varying widths and thicknesses, and number of teeth to the inch.

★ Star Blades ★ with 14 Teeth to the Inch are Suitable for Every Class of Work Except Tubing Less Than 1-16"

—For This Gauge Use ★ Star Blades ★ with 24 Teeth
The material, finish and lasting qualities of ★ Star Hack Saw Blades ★ have been the standard by which all Hack Saw Blades have been judged for over twenty-five years.

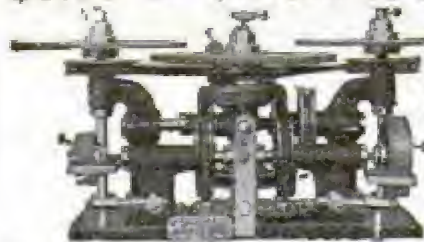
ALL DEALERS SELL THEM

Have you sent for your copy of our free book "Tool Practice"?

**MILLERS FALLS CO., 28 Warren Street
NEW YORK CITY**

\$5.00 to \$10.00 A Day Made Easy

**The "American"
No. 3 Patented**



Hones razors, sharpens all kinds of safety razor blades, clippers, scissors, etc. No make-believe, but the real thing. Complete outfits furnished with instructions how to do the work. No previous experience required.

Address, Mgr. Dept. 1208, Illinois Cutlery Company, 184 Washington St., Chicago

AGENTS

Make \$30 Per Wk.

This AWL sews a lock stitch like a machine. Best thing ever made for repairing Harness, Shoes, etc. A dozen exclusive features. Demand is immense. Sales astounding. Roy Sage writes "Rec'd Awl today sold 5 in 15 min." L. Perrine says "Sold 9 on way home with sample." Lowest price, biggest profit, greatest value, quick sales. Drop everything and write for sample and instructions.



ANCHOR MFG. CO., Dept. 940, DAYTON, O.



**The American Combined Level and Grade Finder
Most Practical, Durable and Convenient Instrument Made**

At one glance you can get the true slant on any line or grade either in degrees, inches or percentage, or all at the same time, and will at once give the exact distance needed to plumb up to a true level. The longitudinal recess shown in cut is well worth the low price of the instrument. Write AT ONCE for circular and Testimonials. Special Introductory Price given to First Applicants with privilege of taking Agency. Address **EDWARD HELB, Mfr., Box 75, RAILROAD, PENNA.**

GASOLINE SOLDERING IRON BLOW TORCH

Cuts the time and fuel bill
50%. Get Booklet today.



EMMELMANN BROS. MFG. CO., INDIANAPOLIS, IND., U.S.A.

PECULIAR PRIZES—Germany is ahead in novelties of a charitable nature. In the town of Haschmann prizes are offered yearly for the men who will marry the ugliest and most crippled women, and for the women over 40 who have been jilted at least twice. The money was left by a big financier, who, realizing that beauty is an

THE EXCELSIOR BRAD SET. PRICE 25 CENTS

Takes No. 18
and No. 20
Brads from 1/4
to 3/4 in. long



**THIS END IS
MAGNETIZED**

The tool illustrated above will be indispensable to the Pattern Maker, Cabinet Maker, or Picture Framer who purchases it. It will set brads in places that would be inaccessible without it, and dispenses with the bradawl and nail set. If, after a fair trial, you are not satisfied that you have received your quarter's worth, your money will be promptly returned to you on receipt of tool.

STANDARD TOOL AND SUPPLY CO., TORRINGTON, CONN.



**A GOOD HOME
BENCH AND GOOD TOOLS**

afford profitable occupation for the boy who is taking Manual Training as well as for the man around the house. The bench shown here is only one of our styles—others may suit you better. They make ideal Christmas Presents.

"OHIO" TOOLS

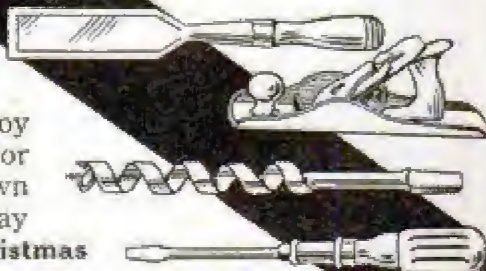
are carefully made throughout by skilled workmen, treated and tempered by the most improved methods, and are known to particular tool users as the best in the market—fully warranted.



Insist on this trade mark when buying Planes, Chisels, Drawing Knives, Auger Bits, Screw Drivers, etc.

Write for our free Catalogue

**OHIO TOOL CO. (Dept. 3)
COLUMBUS, OHIO**





Free Booklet

We have just issued a booklet called "Saw Points," that will show you the proper way to care for your Saw.

Every user of a Saw should know how to care for it, as a Saw won't saw unless it is properly set.

A Saw will render poor service if not kept in good condition and a Saw to obtain the best results with the least possible effort must be properly set and sharpened.

Send a postal for our booklet No. 8, "Saw Points." It will tell you the correct method of using the Morrill Saw-Set.

CHAS. MORRILL

277 Broadway

NEW YORK

FOR MENDING HARNESS

shoes, tents, awnings, pulley belts, carpets, saddles, suit cases, buggy tops, dash boards, or any heavy material. Stewart's Automatic Awl is the only perfect Sewing Awl.

STEWART-SKINNER CO.
26 Hermon Street
Worcester, Mass.



The Handiest Tool Holder Made

Constructed of hardened steel; accurately machined; and will hold securely, round, flat, square, hexagon, and shaped tools in the tool post, from the largest sized tool down to a No. 60 drill. Write for full particulars, and prices. Satisfaction guaranteed.

B. MORGAN, Manufacturer of SPECIALTIES
Bellevue St., Newport, Rhode Island

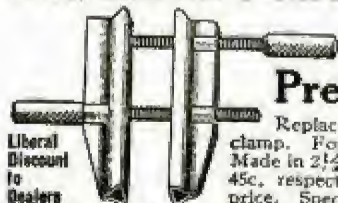
attraction hard to overcome, made a provision in his will that out of the income of the fund not less than £16 shall go with the ugliest girl in any year, and the cripple shall receive £12. The poor women over 40 who have been jilted by a lover receive, when the funds permit, £10 each, but the trustee can vary this amount, and, at his own discretion, offer a larger prize to some one who will marry an unusually ugly girl, or one to whom nature has been specially unkind.—Detroit Free Press.

MR. HANDY-MAN'S WORK-BENCH

IS NOT COMPLETE WITHOUT

PARKER'S

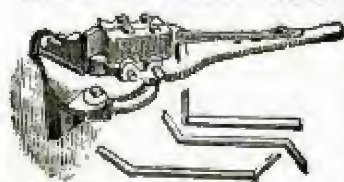
Pressed Metal Clamp



Liberal Discount to Dealers

JOHN L. PARKER CO., Metal Stampings, 62 Jackson St., WORCESTER, MASS.

WE SHIP ON APPROVAL



Our Hand Power Angle Benders are so indispensable for bending rods, squares, and flat pieces into all sorts of angles that we do not hesitate to ship tools for 10 days free trial. Made in 3 sizes to cover a wide range of work. We also make hand power tools for bending eyes, hooks, "U" shapes, hinges, rings, etc. Write for complete descriptive catalogue

WALLACE SUPPLY CO., 124 No. Jefferson St., Chicago; 26 Cortlandt St., New York City

Toolmakers and Machinists. Here's a Portable convenient arrangement of different sized drawers, all felt lined, with a place for every tool. No need of throwing one on top of the other. This Case will pay for itself in saving tools, time and drayage expense. You need one of the many styles shown in our catalogue which we will mail free. No mechanic is up-to-date without a "Gerstner" Case.

Gerstner & Sons

Mfrs. of Mechanics' High Grade Tool Cases
818 Germantown Street, DAYTON, OHIO



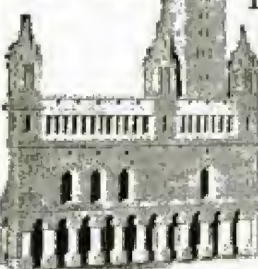
Fun for the Family

WITH

Richter's Anchor Blocks

These beautiful blocks, made of eternal stone in soft and permanent colors, are appreciated by the entire family. Richter's Anchor Blocks fascinate young and old. They are the best Christmas gift for any child, for their charm is as lasting as the blocks themselves.

This illustration shows a model of Madison Square Garden constructed from Richter's Anchor Blocks



KING OF TOYS

Richter's Anchor Blocks are the King of all Toys for with them the child learns through play. The beautiful architectural designs develop the artistic taste and their construction entertains young and old for hours at a time.

These wonderful stone building blocks made in Rudolstadt, Germany, are the very embodiment of the educational principles of the great Froebel himself. Richter's Anchor Blocks are educational and fascinating.

Beautiful Catalog FREE

To all who are interested in children, we will send our beautiful forty-eight page catalog in colors, showing many splendid designs that can be created with these wonderful Anchor Blocks, the toy that educates the child through play. Children never tire of them and they last forever.

FILL OUT AND SEND THE COUPON TODAY

Investigate this fascinating toy. Ask your dealer about Richter's Anchor Blocks. If he does not keep them, simply fill out and send the coupon and receive our beautiful catalog free and postpaid.

COUPON

F. AD. RICHTER & CO.,
215 PEARL ST.,
DEPT. 1199
NEW YORK CITY,
N. Y.

F. AD. RICHTER & CO.,
215 Pearl St., Dept. 1199
NEW YORK CITY, N. Y.

Gentlemen: With no obligation whatever upon me you may send me free and postpaid one of your catalogs showing colored designs and describing Richter's Anchor Blocks.

NAME

ADDRESS


Please Mention Popular Mechanics



Prest-O-Lite

The only efficient lighting system for automobiles and motorcycles. Our booklet describing Prest-O-Lite Tanks for automobiles and motorcycles, Prest-O-Tire Tanks, Prest-O-Tire Tubes and Prest-O-Carbon Remover will be mailed on request.

The Prest-O-Lite Co.
265 East South Street
INDIANAPOLIS, IND.




WE SELL YOU AT WHOLESALE

Agents' Price One
AMERICAN
Motorcycle or Bicycle

We give 30 Days' Free Trial and Prepay the Freight. Write for our introducing offer and catalog and say whether you want Motorcycle or Bicycle. Do it now.

AMERICAN MOTOR CYCLE CO., 1012 American Bldg., CHICAGO




SCHACHT

3 Cars in 1—\$850.00

The Schacht is the greatest under \$1000 car ever put on the market for it not only is a remarkably staunch and speedy roadster, but the addition of a rear seat makes of it a big, roomy family car; or the addition of a box, an up-to-date delivery car.

SEND FOR CATALOG

"Made and marketed in Canada exclusively by the SCHACHT MOTOR CAR COMPANY of Canada, Ltd., Toronto and Hamilton, Ont."

THE SCHACHT MOTOR CAR CO.
2802 Spring Grove Ave., CINCINNATI, OHIO



Protected against the Weather in 30 seconds time—without leaving your seat

The Limousine Buggy

In pleasant weather your Cozy Cab is a smart, light-running buggy, open to the breeze on all sides.

In stormy weather it is a wind-tight, rain-proof Cozy Cab as shown above.

Just three, simple, one-hand movements release the swinging front window and close the roller door side curtains. You don't need to leave your seat, or even drop the lines.

You have completely shut out the weather, without in the least cutting off your view of the road.

There is plenty of room with a system of ventilation which provides fresh air without draft.

Sent anywhere for 30 days' free trial, and fully guaranteed.

Write today for our handsomely illustrated catalogue and details.

Fouts & Hunter Carriage Mfg. Co.
Dept. PM-4 Terre Haute, Ind.



Convert Your Bicycle Into a Motor-Cycle

using our Attachable Outfit. Fits any wheel. Also Marine and Stationary Motors and Finished Castings. Stamp for catalog.

STEEFEY MFG. CO.,
Girard Ave. and 30th St., PHILADELPHIA, PA.



Ten Days' Free Trial

allowed on every bicycle we sell. We ship on approval and trial to anyone in the U. S. and prepay the freight. If you are not satisfied with the bicycle after using it ten days, ship it back and don't pay a cent.

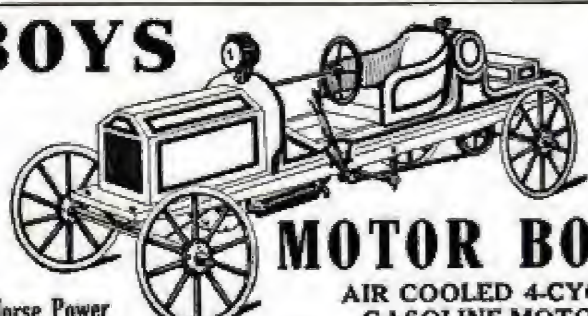
FACTORY PRICES Do not buy a bicycle or a pair of tires from anyone at any price until you receive our latest Art Catalogue of high grade bicycles and sundries and learn our unheard of prices and marvelous new special offers.

IT ONLY COSTS a cent to write a postal and everything will be sent you FREE by return mail. You will get much valuable information. Do Not Wait; write it Now!

TIRES, Coaster-Brake rear wheels, lamps, parts, repairs and sundries of all kinds at half usual prices.

MEAD CYCLE CO. Dept. W 108 CHICAGO

BOYS



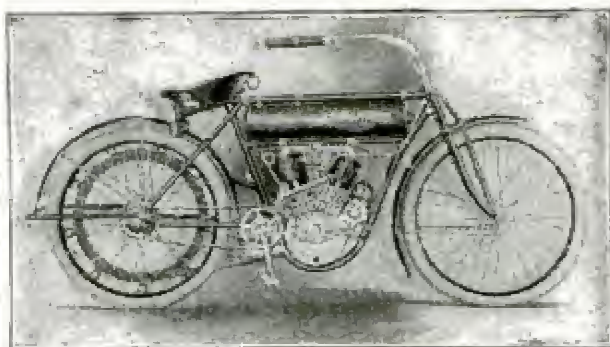
MOTOR BOB

AIR COOLED 4-CYCLE GASOLINE MOTOR

2 Horse Power

A PRACTICAL MINIATURE AUTO propelled by a small gasoline motor. The greatest instructive, mechanical device ever invented. Boys all over the world now building Motor Bobs. Any boy of twelve years and up can build and operate the Motor Bob. Send 25c for our complete instruction booklet, "HOW TO BUILD A MOTOR-BOB," which contains simple drawings, diagrams, pictures, instructions for building and operating and list of parts.

Dept. 14, MOTOR BOB MFG. CO., Main & Amherst Sts., Buffalo, N.Y.



THE FLYING MERKEL

"The World's Most Comfortable Motorcycle"

Prices on all models have been reduced, making "The Flying Merkel" the ideal motorcycle investment. It is the only Spring Frame and Spring Fork motorcycle, a unique feature that eliminates all jolting and vibration. For comfort, economy and durability, you should own a "Flying Merkel."

Send for catalog describing the various models

THE MIAMI CYCLE & MFG. CO.
350-370 Hanover St. MIDDLETOWN, OHIO

FLOUR FROM SUGAR BEETS—An entirely new use, and one that may in time become very important, has been discovered for sugar beets. This is the making of them into flour. This flour is now being manufactured in considerable quantities at Suresnes, in France, where an immense dryer has been built for the purpose.

The first part of the process consists in chopping up the beets and drying the water out of them. They contain to start with 72 per cent of water, nearly all of which is removed by evaporation. By this means 100 lb.

United States Tires

Continental
G & J

Hartford
Morgan & Wright

ARE GOOD TIRES



\$40 Motorcycle

We have the largest line of new and used Motorcycles in the country at the lowest prices. We also have a thoroughly equipped repair department and are in position to furnish repairs for any machine. Send us your machine to be overhauled. We pay cash for second hand motorcycles. Send for Catalog.

HARRY R. GEER CO., 888 McLaren Ave., ST. LOUIS, MO.



Solar Motorcycle Lamps

are the neatest looking, strongest and most efficient lamps made. The product of light specialists, makers of 90% of the automobile lamps used on the high grade cars of America. Catalog shows many styles — gas, oil and electric. Write for it today.

BADGER BRASS MFG. CO.
Kenosha, Wis. New York City, N. Y.

Plugs that Produce Power

—that deliver a "fat" spark every time without skip or miss — plugs that give the maximum power with minimum fuel consumption — plugs that will not foul or soot — are the kind of plugs every motorist wants.



Spark Plugs

*(Guaranteed)

meet all the above requirements. Put them on your car and eliminate all spark troubles. If your dealer cannot supply you order direct.

All Sizes — One Dollar
Mica or Porcelain

MAC-KAE MFG. CO.

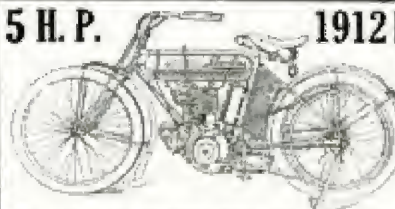
BOSTON, MASS.



* The MacKae guarantee is absolute and unique. Write us for particulars.

5 H. P.

1912 Peerless Motorcycle



With Free Engine Idler and Bench Magneto together with the best there is in motorcycle construction — Power, Silence, Endurance, and those Wearing Qualities so essential for low cost of maintenance.
5 MILES FOR ONE CENT
Agents Wanted — Liberal Discounts

PEERLESS MOTORCYCLE CO., 179 Huntington Ave., BOSTON, MASS.

MAKE A MOTORCYCLE OF YOUR BIKE



at small cost, by using our attachable outfit. It fits any bicycle. Motorcycles, all makes, new and second hand \$35.00 up. Send stamp for catalogue and bargain list. Keller's new 104-page booklet, "Construction, Management and Care of Motorcycles" is now ready. Price, postpaid, 25c.

SHAW MFG. CO., Dept. B, Galesburg, Kansas

\$3000.00 IN ONE YEAR



One man invested his SAVINGS in an Auto Tire Repair Plant and made \$3000.00 the first year and was worth \$10,000.00 at the end of the second year.

You can make money repairing tires and tubes as evening employment. As an independent occupation, you can turn out thousands of dollars gross business per year. Investment small. Write for information.

MOTOR APPLIANCE CO.
1206 Bellefontaine, Indianapolis, Ind.

Real Gas Light at

One-Half Cost of Kerosene

In your own home, no matter where you live, you can have all the warmth, light, comfort and convenience of city gas. You can do away with smelly, smoky kerosene lamps and save the dirty work of caring for them. You can do away with danger from fire or explosion, have more and better light—six times as much light—all for half your present expense for kerosene. That is what we offer you in the

B & W Gas Light Plant sold on easy payments

From \$50 upward you can get a complete 4-room lighting plant—fixtures and everything (installed at our expense). You can extend it to other rooms, to the front porch, barn or cellar at slight additional cost. You can cook with it or heat any room with it. If you are a responsible person you can pay for it on easy monthly payments if desired. Write us a postal now for our illustrated free book telling all about this new gas light. Without expense or obligation on your part we will submit contract price for equipping your home.

Write Now—Agents Wanted

BOLTE & WEYER CO.

Lighting Engineers

131 S. Center Avenue, CHICAGO



Health? Take Turkish Bath At Home—Only 2c

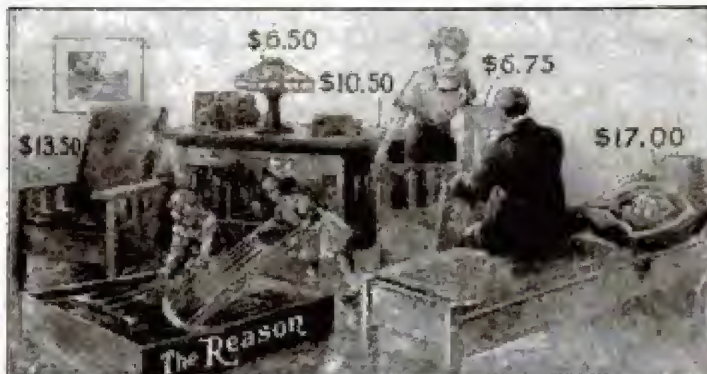


Exhaustion and many other ills means that waste matter has over-accumulated in your body. Drugs do not drive them out. Exhausted men and women have been remarkably strengthened, right at home, in a few moments' time, by the use of

ROBINSON'S TURKISH BATH CABINET

Prominent physicians in many cases are abandoning drugs for this new treatment. If your mind or body is tired, or you have rheumatism, blood, stomach, liver, kidney and skin troubles, open your pores, and feel the rapid change in your condition, right at home, at cost of 2c a bath. The Robinson Bath Cabinet is the only scientifically constructed bath cabinet ever made, a model of ingenuity. **Great \$2 Book Sent FREE**—"The Philosophy of Health and Beauty" represents lifelines of thought of well-known scientists and is written plainly so that anyone can understand every word. Write in time—today. Agents wanted in unoccupied territory.

ROBINSON MFG. CO., 172 Snowflake Bldg., Toledo, Ohio



YOU can unpack and assemble ready to use all the above furniture in one evening.

The Reason back of these sensational prices is our original system of manufacturing in sections and shipping direct to you knocked down in a compact box.

This reduces the freight rate two-thirds, eliminates expensive wrapping and crating and avoids two profits; also clerk hire, store rent, expense and investment.

You do not risk one cent. Use the furniture for thirty days in your home. Prove our claim that you cannot duplicate it for double our price—then if you are not satisfied notify us and we will return all the money you have paid. We make quality furniture only.

Free catalog of 100 bargains, giving full details. A postal brings it to you.

BROOKS MFG. CO.

712 Rust Ave.

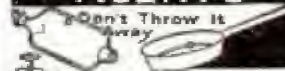
SAGINAW, MICH.

The oldest and largest firm of its kind in the world.

of dry material is obtained from 357 lb. of beets.

This dry material contains more than 70 per cent of sugar, and therefore on being ground to a fine meal is exceedingly sweet and adapted to the making of cakes and puddings. The sugar-beet flour is estimated to contain something like 82 per cent of pure nutriment.—Baker's Weekly.

AGENTS - \$45.00 A WEEK



MENDETS

Don't Throw It Away! Mend all leaks instantly in graniteware, hot water bags, tin, copper, cooking utensils, etc. No heat, solder, cement or rivet. Any one can use them. Fit any surface. Smooth. Sample box, 10c. Complete box, assorted sizes, 25c, postpaid. Wonderful opportunity for live agents. Write today. Collette Mfg. Co., Box 1116, Amsterdam, N.Y.

BUY PLUMBING SUPPLIES AT WHOLESALE



Will Save You 30% Don't pay retail prices. Full stock on hand for prompt shipment. Send for free catalog. R. P. KAROL 768 to 772 West Harrison St., Chicago.

Will You Try "COME-PACKT" At Our Risk?

Read THIS! Use Come-Packt Furniture in your home for a year—give it the test of service—your money back any time you say. **THAT'S the proof.**

Made from choicest of hardwood—Quarter Sawn White Oak—splendidly fashioned, honestly built and handsomely finished. Exclusive designs that are simple, dignified, forever pleasing. Your choice of eight finishes.

For Christmas, a piece of Come-Packt Furniture will give lasting satisfaction. We ship promptly.

And You Save Over Half

by buying direct from our factories. Our new Toledo plant makes still greater economy and still prompter shipments possible. Our Big "Money-Back Catalog" has six money-saving departments. A Postcard brings it postpaid. Write TODAY to

COME-PACKT FURNITURE CO. (Formerly Ann Arbor)

1201 Fernwood Ave., TOLEDO, OHIO



\$8.75



\$11.75

THE WIZARD LIGHT



THE INSTANTANEOUS SYSTEM
REQUIRES NO GENERATION
WHEN YOU WANT LIGHT
JUST PULL THE CHAIN

WIZARD
FOUR MANTLE ARC

THE "QUICKLIT" No. 30
LIGHTS WITH A MATCH
AS CONVENIENT AS CITY GAS

THESE latest inventions represent the acme of perfection in artificial lighting. After once installed the instantaneous system requires no generation and can be operated as conveniently as electricity at one-tenth the cost.

The Quicklit Systems are operated as conveniently as city gas, as lamps are lit with an ordinary match.

All our lighting systems represent the highest standard of quality and are fully guaranteed. They are so simple that any one can operate same.

For further particulars and exclusive agency address
THE NAGEL-CHASE MFG. CO., 153 West Ohio St., Chicago, Ill.




TABLE LAMP

A LAKE IN THE SEA—About halfway between Fiji and the Samoan group is a very peculiar formation which has been termed the Ring Island of Ninafou.

Great black walls, circular in form and of considerable distance across, rise from the sea, inclosing a calm body of water. The sea on the outside is rough and storm-swept most of the time.

The circular cliffs are said to be of volcanic origin, and the cavity containing the body of water is supposed to be the old crater which has ceased to throw up its columns of smoke and pour its molten lava into the ocean.

Nearly 40 years ago an eruption on the eastern side

AGENTS



Make '30 to '60 Weekly

Selling our new and unequalled portable gasoline table and hanging lamp for lighting city and rural homes, stores, halls, churches. Most powerful light known. Absolutely safe.

WE LOAN YOU SAMPLE

More brilliant and many times cheaper than gas or electricity. Guaranteed five years. Everyone a possible customer. No experience necessary. Large commissions. Exclusive territory free. Write today.

SUNSHINE SAFETY LAMP CO
102 Factory Bldg., Kansas City, Mo.

WANTED

FREE THIS ALADDIN LAMP FREE
BURNS KEROSENE (COAL OIL)

Outshines city gas or electricity. Simple, noiseless, odorless, clean, safe, money-saving. Guaranteed. Write nearest office for catalogue and learn how to get an Aladdin Mantle Lamp FREE.

AGENTS T. H. BALL SOLD 850 on money back guarantee, not one returned. Stacey sold 12 in one hour. Newsom sold 12 in 10 calls. Gibson sold 48 in 5 days. Sells itself. Needed in every home. Our Sunbeam Burner fits other lamps. Complete line for homes, stores, etc. Ask for our liberal agency proposition.


MANTLE LAMP CO. OF AMERICA, Dept. 36-P
Offices at—Chicago, Ill., Portland, Ore., Waterbury, Conn., Dallas, Tex., Winnipeg, Montreal, Canada



AIR GAS! LATEST INVENTION

Standard Vacuum Gas Machine makes gas automatically! Uses 97% ordinary air! Cheapest, safest, most hygienic for lighting, heating and cooking! All conveniences of city gas! Non-poisonous, non-asphyxiating, inexplosive and in-odorless! Machine always ready! Gas can be made for 15c per 1000 cu. ft. 25 times cheaper than acetylene! Cheaper than kerosene lamps, electricity or city gas! Saving will pay for the machine in a few months! Agents wanted everywhere in the United States and abroad! Machine of 25 light capacity, \$125.

Standard-Gillette Light Co., 108 Michigan St., Chicago, U.S.A.



Wunder-lite

Don't envy the city man when you can have a lighting system of your own—brighter than gas, convenient as electricity. A 500 Candle Power Light in each room at one-tenth the cost of ordinary lights. Instantaneous—just pull the chain and flood the room with light. Write today and learn how to install this handsome Wunder-lite system in your home without cost.

WUNDER-LITE CO.

AGENTS WANTED 208 Julia St., Grand Rapids, Mich.

TRIUMPH STAND LAMP

A 300 Candle Power Lamp for Home, Store, Shop, work bench, library, desk, or wherever a steady and powerful light is wanted or stand lamp can be used. Can be turned up and down like gas, and carried around with more safety than a kerosene lamp, and gives 10 times the light at less than 1/4 the cost to operate, which a child can do. Better than gas or electric lamps because there is no hose or drop wire to prevent their being used anywhere, and will make a most attractive and desirable

Christmas Present

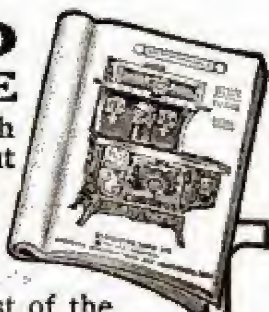
We have five other distinct lines of gasoline lamps, Hollow Wire Systems, and individual gravity lamps, unequaled by any other house. Every one a success and winner. Our POP Catalog tells all about them. Get it now and decide which line you want.

BRILLIANT GAS LAMP CO.
Dept. 1, No. 182 N. State Street, Chicago, Ill.



Kalamazoo Stove Book FREE

Write for the stove book with the astounding inside facts about stove making and stove selling—how you can save \$5.00 to \$40.00 by buying stoves direct from the factory. Built by experts—prices \$6.50 and up, east of the Mississippi. Stove Book yours for the asking with description of 400 sizes and styles of stoves—richly illustrated.



Stove or Range Shipped Freight Prepaid 30 Days' Trial



You don't decide finally until you've used the stove or range 30 days and then it comes back to us—at our expense—if you're not satisfied. 170,000 people have tried Kalamazoo's and bought. 360 Day's Approval Test. Cash or credit terms, shipment within 24 hours. Repairs at cost or less if ever needed. Your interest demands that you get our proposition first. Now send for the Stove Book and Catalog No. 473 at once.

KALAMAZOO STOVE COMPANY MFRS.
KALAMAZOO, MICHIGAN

"A Kalamazoo Direct To You"
And Gas Stoves Too

DON'T PAY TWO PRICES

Save \$18.00 to \$22.00 on

HOOSIER RANGES AND HEATERS



Why not buy the best when you can buy them at such low, unheard-of Factory Prices? **THIRTY DAYS' FREE TRIAL BEFORE YOU BUY.** Our new improvements absolutely surpass anything ever produced. **SEND POSTAL TODAY FOR OUR FREE CATALOG AND PRICES.**

HOOSIER STOVE FACTORY, 249 State St., Marion, Ind.

WHEN YOU WANT ANYTHING AND DON'T KNOW WHERE TO FIND IT
WRITE BUREAU OF INFORMATION,
POPULAR MECHANICS CHICAGO

Test "IMPERIAL" 30 Days In Your Own Home at OUR RISK



Thousands now in use! Demand growing amazingly! Housewives delighted! The result surprises even themselves!

Has exclusive features, such as: Odor Hood—Carries all steam and cooking odors to chimney. Ash Sifter—Permits sifting ashes right in range. Oven Thermometer—Stone Oven Bottom—Absorbs and holds heat in oven; a fuel saver. Direct from factory to you at Wholesale Price, Freight Prepaid. Easy Credit Terms if wanted. **365 Days' Guarantee!**

Write Today for Free Catalog and Special Prices
THE IMPERIAL STEEL RANGE COMPANY
469 State Street, Cleveland, Ohio

HOT WATER AND STEAM HEATING PLANTS

We are manufacturers and can save you money. Write for our catalogue and prices. We make complete plans and help you in every way possible.

CONCORD MANUFACTURING CO.
429 E. Third St. DAYTON, O.



of this island caused quite a peninsula to be formed. The rough seas sweep against this with great force, and it is quite common to find fragments swept away by the continued dashing of the waters.

King Island is rather difficult to visit, owing to the rough cliffs that form its outer edges. Vessels have

2¢ A WEEK

A safe, very brilliant, powerful, steady, white light. Is better than electricity or acetylene and cheaper than kerosene.

Every lamp is a complete self-contained miniature light works.

Clean—bright—odorless—portable. Made in over 200 styles for every purpose. Fully guaranteed.

Catalog free. Agents wanted.

THE BEST LIGHT CO.
324 E. 5th Street
Canton, O.

THE "BEST" LIGHT.

Buy Direct—Save Money—We Pay Freight

Our monthly installment plan of selling direct saves you the dealer's profit and his excessive charges for installation and repairs. You can save at least 1/3 the cost of your furnace. We have been building Jahant Furnaces for over 30 years and guarantee satisfaction.

JAHANT DOWN DRAFT FURNACE

THE BEST HEATING SYSTEM MADE for residences, schools, hotels, churches, etc. It is the most economical furnace too and saves 1/3 to 1/2 the cost of fuel because the patented "Down-Draft System" burns wood, hard or soft coal, and burns it ALL without clinders, clinkers or any waste. Needs less attention, yet heats much better than any other furnace, not air, steam or hot water heating system. Our plan of monthly payments

ONLY \$10 DOWN and \$10 A MONTH

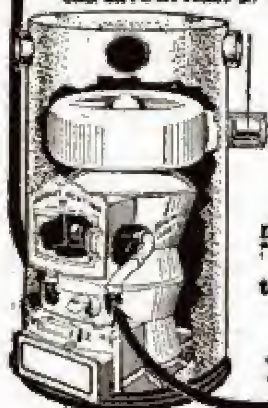
makes it easy for any one to have the best heating system made. Every Jahant Furnace is sold with a strong "Guaranty Bond" that allows you 365 DAYS TRIAL. You don't run any risk buying from us. We send complete outfit, furnace, pipes, registers, etc., together with special plans, full directions and all tools for installing. If you can drive a nail you can install a Jahant Furnace without the aid of a tinner.

Write To-Day for Catalog

which explains the Jahant Down-Draft System and tells why it gives more heat at less cost.

THE JAHANT HEATING CO.,

3 Mill Street, Akron, O.



HESS MEDICINE SANITARY LOCKER



The Only Modern, Sanitary STEEL Medicine Cabinet

orlocker finished in snow-white, baked everlasting enamel, inside and out. Beautiful beveled mirror door. Nickel plate brass trimmings. Steel or glass shelves.

Costs Less Than Wood

Never warps, shrinks, nor swells. Dust and vermin proof, easily cleaned.

Should Be In Every Bath Room

Four styles—four sizes. To recess in wall or to hang outside. Send for illustrated circular.

The Recessed Steel Medicine Cabinet

HESS, 910 L Tacoma Bldg., Chicago
Makers of Steel Furnaces. Free Booklet.



By All Odds the most satisfactory lighting systems made are the

Yale "Arcolight" Pipe System

and the

"Yale Special" Hollow Wire System

Easy to install, easy to operate and approved by all insurance underwriters. Lights instantly. For stores, churches, homes. Gives a soft, brilliant light. 10 times that of electricity at 1/4 the cost. Sold strictly on Merit and shipped complete ready to set up. Guaranteed 2 Years.

Write for catalog. Agents wanted.

YALE MFG. CO., 28 S. Clinton St., Chicago

difficulty in finding a safe harbor, and it is only the more venturesome explorers who risk a visit to this curious piece of midocean formation. Internal forces may change the form of the island at any time, although it is the opinion of most scientists that this volcano is now perfectly extinct, and will remain so.—New York World.

A BEACON LAMP BURNER FREE WANTED



Incandescent. 100 Candle Power. Burns common coal oil. Gives better light than gas, electricity or six ordinary lamps at one-sixth to one-tenth the cost. Fits your old lamp. Unequaled for fine sewing or reading. COSTS ONLY ONE CENT FOR SIX HOURS. We want one person in each locality to whom we can refer new customers. Take advantage of our special offer to secure a Beacon Burner FREE. Write today. Agents Wanted. HOME SUPPLY CO., 248 E. C. Life Bldg., Kansas City, Mo.



If You Are In Doubt What to Buy

for Mother, Wife, Sister or Friend, remember that a

BISSELL

"Cyco" BALL-BEARING Carpet Sweeper

never fails to please, and is a constant reminder of the giver for ten years and more. It reduces the labor about 95%, confines all the dust, brightens and preserves the carpets, and will outlast forty brooms. Prices \$2.75 to \$5.75. Sold by dealers everywhere. Write for booklet showing our most popular styles.

A Christmas Gift for YOU

Buy of your dealer between now and January 1st, send us the purchase slip within one week from date of purchase, and we will send you a fine quality black leather card case with no printing on it

Address Dept. 153

Bissell Carpet Sweeper Co., Grand Rapids, Mich.

(Largest and Only Exclusive Carpet Sweeper Makers in the World.) (10)



NULITE GASOLINE TABLE LAMP

A complete Light Plant weighing 7 pounds, Portable, absolutely safe, 300 C. P., brilliant light 1/2 cent per hour. Saves 90% of your light bill.

AGENTS—Write for Special Offer on complete line of gasoline lights and systems. Over 200 different styles. Highest Quality. Lowest Prices. Exclusive territory for town, country and traveling salesmen. 72 page illustrated catalog free. Write to-day.

NATIONAL STAMPING & ELECTRIC WORKS
422 S. Clinton St. CHICAGO, U. S. A.

GUNN SECTIONAL BOOK CASES

You will save money by putting these bookcases in your home.

The handsome designs, the rich finish, the removable non-binding doors, the absence of disfiguring iron bands make them far better than the old fashioned kind.

Our prices are lower than others

and high quality is guaranteed. Write for our artistic catalogue PM with colored illustrations showing Sanitary Clawfoot, Mission and Standard Styles. Sold by dealers or direct.

GUNN FURNITURE CO., 55 Victoria Street, GRAND RAPIDS, MICH.

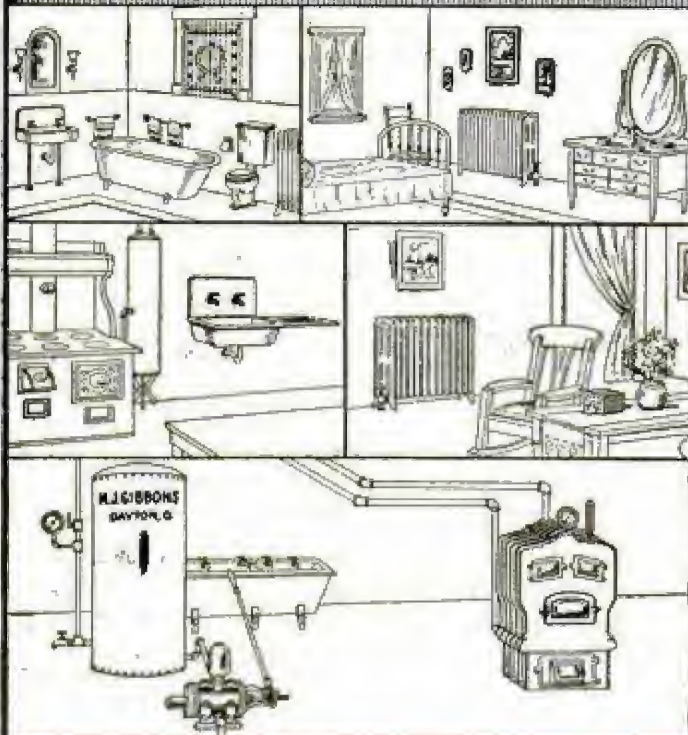


RUNNING WATER

in
your
home

\$42

Complete Hot-Water and Steam-Heating plants \$120 up



Fresh running water for your bathroom, kitchen, laundry, stables, gardens. Plants, all sizes, \$42 and up. Operated by hand power, electric motors or gasoline engines.

THIS COMPLETE BATH-ROOM OUTFIT FOR \$38.95

All kinds of plumbing supplies at factory-to-you-direct prices.

Heating Plants—Save \$100 to \$250 on a modern Heating System. Steam Heating Plants \$120 up. Hot water plants \$140 up.

Lighting Plants—Complete Electric Plant, including gasoline engine, dynamo, switchboard and storage battery, \$256.

Important—We will furnish free with every water, heating or lighting plant special plans for your individual home. Anyone can install with these complete drawings.

THIS BIG FREE CATALOG SHOWS THOUSANDS OF BARGAINS. Gasoline Engines; Farm Tanks and Pumps; Hydraulic Rams; Pipes; Valves; Gas and Electric Fixtures. Write for catalog today. Buy from us and save 50 per cent. We have the most complete line of PLUMBING, HEATING and LIGHTING goods in the U. S. and we GUARANTEE absolutely everything you buy. Write today for catalog.

M. J. GIBBONS

Dept. A

Dayton, Ohio



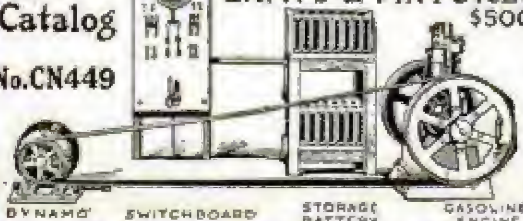
**Light
your
Home with
ELECTRICITY**

Costs little with a Fairbanks-Morse outfit. Gives you the brightest, healthiest, most convenient light known. Our low-voltage outfit is absolutely safe, easy to install and care for. Engine can be used for other farm machinery or water supply. Battery supplies current when engine is not running.

Write
Today
for
Catalog

No. CN449

50-LIGHT, 30-VOLT
OUTFIT COMPLETE
INCLUDING MAZDA
LAMPS & FIXTURES \$500



Fairbanks-Morse & Co.
900 S. Wabash Ave. Chicago, Ill.

At the Victoria mine in the Lake Superior copper country, says the Engineering and Mining Journal, every piece of machinery around the mine is operated either directly or indirectly with compressed air; the only places where heat is used are a stove for reheating a part of the air for the stamp head and in the black-smith forge.

\$3 a Day Sure

Send us your address and we will show you how to make \$3 a day absolutely sure. We furnish the work and teach you free. You work in the locality where you live. Send us your address and we will explain the business fully. Remember we guarantee a clear profit of \$3 for every day's work absolutely sure. Write at once.

ROYAL MANUFACTURING CO., Box 1702 DETROIT, MICH.

Folding BATH TUB

Costs little, no plumbing, requires little water. Weight 18 pounds, and folds into small roll. Full length baths, far better than tin tubs. Lasts for years. Write for special agents offer and full description. **ROBINSON MFG. CO., 654 Jefferson Ave., TOLEDO, OHIO.** Manufacturers Turkish Bath Cabinets.

1900 Motor Washer Electric or Water Power

on Free Trial to Readers of Popular Mechanics

Reduce household expenses by using this great laundry outfit. Cuts cost of washing to 2 cents per week. Write for Free Book, giving full details, to

1900 WASHER CO., 5029 Court St., Binghamton, N. Y.

Address Canadian 1900 Washer Co., if you live in Canada

Brainy Diet

"Fat, oil, butter, cream and eggs certainly caused my catarrh and deafness, but your diet of lean meats, green vegetables, fruits, etc., cured me in a few weeks. My brain power and complexion improved tremendously, and I succeeded financially." Different classes of foods cause different diseases, but correct combinations cure. Foods which cause expectoration, catarrh, fevers, rheumatism, constipation, etc., are specified in 4 very instructive booklets—sent for ten cents.

G. H. Brinkler, Food Expert, Dept. 16, Washington, D. C.

ASTRONOMICAL TELESCOPE

Length 36 $\frac{3}{4}$
inches. 2 inch
object glass

Complete with Case, Sun Shade, Sun Glass and Extra Eye Piece for Night Observation. **\$18**



One of these superb instruments will give material enjoyment. It will enable you to pick out the smallest Boats on the Horizon, tell the time by a clock many miles distant, and view the country

for fifty miles around. This telescope is made for Astronomical Work. With its aid the Mountains in the Moon, Jupiter's Moons and Saturn's Rings are clearly discernible.

Prof. Hicks, of Word and Works Almanac, says it is far superior to others he has examined at twice the price.

CATALOGUES SENT FREE ON APPLICATION

A. S. ALOE CO., 515 Olive St., ST. LOUIS, MO.

LET US GIVE YOU THIS TRANSPARENT CELLULOID TRIANGLE

It is 4 inch size, 30°+60° angles. Lowest retail price, 25 cents. Absolutely essential to everyone who draws. We make this offer to introduce our new catalogue showing

SPAULDING'S NEW CARRYING CASES AND COMPLETE OUTFITS

for designers, architects, engineers and students—compact, durable and convenient. Spaulding's Carrying Cases are made light and strong. They provide well arranged compartments, including space for drawing board and T square. Handled like a suit case; unique, practical, inexpensive. Outfits include all necessary equipment. If you draw, send us five 2-cent stamps to-day to pay postage and get the free triangle and the catalogue.

SPAULDING PRINT PAPER CO.

44 Federal St.

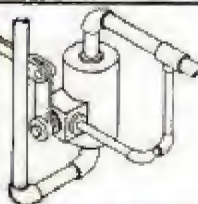
BOSTON

WHERE ICEBERGS GROW—The great breeding place of icebergs is Western Greenland. The mountainous belt of Greenland is everywhere penetrated by deep

LEARN ISOMETRIC DRAWING

Easy to produce quickly read working plans. The isograph makes an expert of a novice. Invaluable to inventors and designers. Handy for any draftsman. Celluloid 6x6 inches. Postpaid 50c with amply illustrated instructions. 2c stamps accepted. Send today.

THE ISOGRAPH CO.
145 E. 23d St. NEW YORK CITY



DRAW IN COMFORT

Hoffman's Pat. Drawing Board Holder

A most Practical Device for use of Illustrators, Newspaper and Commercial Artists, Designers, Patent Draftsmen. A Sketch Table for Architects. Touch-up-table for Photographers. Attach to table, desk, or window sill. Tilt and adjust any angle. Revolves freely. Draw sitting or standing. Firm, Durable. Neatly finished in enamel and copper. Will support board 30 in. sq. Price \$3.50 f. o. b. Columbus, O. Send for Booklet. HOFFMAN SPECIALTY CO., Columbus, O.



Independent Safety Fountain Pen



Can be safely carried in any position. New idea cap locks pen when not in use. All pure rubber and 14 kt. pens. Made in two sizes, 3 $\frac{3}{4}$ " and 5 $\frac{1}{4}$ ", \$1.50 and \$2.00 postpaid.

J. C. ULLRICH & CO., Fountain and Style Pens
27 Thames St., N. Y. C.

NOTE THE SIMPLICITY



Of making perfect duplicates with the Daus IMPROVED Tip Top Duplicator. No intricate mechanism. No printer's ink. Always ready. 100 copies from pen-written and 50 copies from type-written original. Useful in any business. Sent on Ten Days' Trial Without Deposit. Complete duplicator, cap size, (prints 8.5x11 inches.) Contains roll of "Dausco" Oiled Linen Back, duplicating surface which can be used over and over again. Circular of larger sizes free on request. **\$5.00**

FELIX A. L. DAUS DUPLICATOR CO., Daus Building, 111 John St., New York



The rocky road of life is smoothed by "Velvet."



"Velvet" to the pipe is like money to the miser. Fill your pipe once with this much talked about tobacco and see how you come out! It's the famous Burley leaf—and a special selection at that—and aged two years—not two months! The result is rare mellowness—entire absence of the harshness that bites—nothing but smooth smoke for you from morning to night. Haven't you been looking for "Velvet"? 10c at all dealers.

Velvet should be on every dealer's shelf—IF OUT, send us 10c for the regular tin—sent only in United States.

SPAULDING & MERRICK
Chicago, Ill.



Please Mention Popular Mechanics

BISSELL

BARGAINS

in New and Used
Electrical Machinery

You can sell, buy, rent or trade Electrical Machinery by dealing with us. We'll do business your way. Our stocks are large and our prices are low. Tell us your needs; we can help you. No other house can match our bargains on new or used apparatus. Remember you can turn in to us at a good price (Cash or Trade) any apparatus you own and do not want to keep.

Repair Dept. We are equipped with a highly efficient repair department that can handle any repairs. This coupled with unsurpassed shipping facilities assure you quick work and prompt delivery.

The Only House in the World With a
REAL Guarantee on Used
Machinery — Same as We
and Others Give on New

We do give such a guarantee because we have the highest confidence in our used machinery. We thoroughly overhaul it ourselves, and back it up as we do the new.

"Bargain Bulletin No. 20"

Gives hundreds of attractive bargains in new and used Motors, Dynamos, and other Electrical Machinery. How does \$6.75 down to \$5, for quantities, look to you on new 1-20 H. P. Motors? And \$15 on new 1-6 H. P. Low speeds. All sizes between at corresponding prices. All new and in their original shipping crates. These are a few of the many bargains in this Bulletin. You should have a copy. Write today. It's FREE.



We Do Not Handle Novelties or Toys

The F. Bissell Co.

"The House with the Stocks"

226-230 Huron St., TOLEDO, OHIO



The "Electro" Static (Wimshurst) Machine



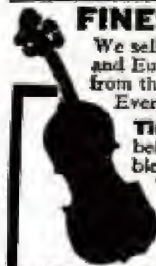
Guaranteed to generate in any kind of weather, no matter foggy or rainy. First machine ever constructed which can truthfully claim this. We absolutely guarantee a **int. powerful 3-inch spark**. Used successfully to operate Geissler and X-ray tubes, charging the biggest Leyden jars, firing powder, working wireless sets, raising a person's hair, etc. Anybody interested in electricity owes it to himself to possess one of these wonderful machines. Can be used to perform thousands of interesting experiments. Cut shows machine plainly. We furnish solid cast iron base, cast iron wheels, two beautiful Leyden jars, and there are two Electrite plates revolving in opposite directions. All metal parts are nickel plated, highly polished. Not a particle of wood used. Sizes all over 8 inches by 5

inches by 11 inches. The weight is 3 pounds. The machine is guaranteed for one year. Nothing to wear out, no batteries, no trouble; simply turn the crank — the machine does the rest.

Price, com- **\$3.75** This price will be raised later. If you are plate, boxed, interested in this machine, send at once for our new booklet giving a lot of experiments to be performed with same. Send to-day 4c postage for our famous 196 page Electric Encyclopedia No. 9, containing over 400 illustrations, lots of information on electrical and wireless subjects. Postal cards not answered.

THE ELECTRO IMPORTING CO., 223a Fulton St., NEW YORK CITY
"EVERYTHING FOR THE EXPERIMENTALIST"

FINEST VIOLINS on 30 DAYS' TRIAL



We sell direct from our Chicago and European shops. Your choice from the finest collection of stringed instruments in America. Everything the violinist needs. Violins from \$5 to \$100 and up.

Time Payments arranged if desired. **30 DAYS' TRIAL** before you decide to purchase. Write **Today** for our valuable Violinist's Catalog. **Sent to you FREE.**

Wm. C. Lewis & Son, Makers and Importers
(Est. 1869) 125 S. Wabash Ave., Chicago, Ill.

Our Specialties: Imported wood, varnishes and tools for violin makers.

arms of the sea which reach to the inland ice and are terminated by perpendicular walls of huge glaciers. All of these glaciers are making their way to the ocean, and as their ends are forced out into the water they are broken off and set adrift as bergs. The sizes of the pieces thus broken off vary, but a berg 200 to 250 ft. in height, and whose length may be from 300 to 500 yd. is considered to be of ordinary size in the Arctic. The volume is, of course, lessened as the berg gets further south.—Marine Journal.

ELECTRIC GOODS for EVERYBODY

Lamps, House Lighting Plants, Telephones, Xmas Tree and Flash Lights, Toys, Railways, Engines, Dynamos, Motors, Belts, Bells, Batteries, Books. Fortune for agents. Big Catalogue 3 cents.

OHIO ELECTRIC WORKS, CLEVELAND, OHIO

Wireless

We publish the best 25c wireless books in the country. Your money refunded if these books are not the greatest value for the money you run across. How to Make Wireless Instruments" by 20 wireless experts, 96 pages, 75 illustrations. "Wireless Telephone" by H. Gernsback, 80 pages, 57 illustrations. "Construction of Induction Coils and Transformers" by H. W. Secor, 100 pages, 72 illustrations. "Wireless Hoo-kups" 100 pages, 161 illustrations. Each book mailed for 25c, or the four for \$1.

MODERN PUBLISHING CO., 231 Fulton Street, NEW YORK CITY

WAAGE ELECTRIC SOLDERING IRONS



Will save its cost in a month's time. No shop should be without one — Small and large sizes adapted for the home mechanic as well as shops and factories. We offer an exceptional bargain on our electric stove at \$3.00. Most interesting and attractive for home use.

WAAGE ELECTRIC CO., Dept. P. M., 680 W. Madison St., Chicago.



Ideal Christmas Gifts

The most wonderful and fascinating study of the age. Everybody should have a copy of the new **"VOLTAMP ELECTRICAL PRODUCTS"** our 112-Page Catalog, now ready. The most complete and interesting book ever issued. Full of illustrations and descriptions of **VOLTAMP Novelties—Motors, Dynamos, Telegraph and "Wireless" Instruments, Spark Coils, Lamps, Flashlights, Transformers, etc.** Everything Electrical for the experimenter. The greatest line of **MINIATURE ELECTRIC RAILWAYS** ever shown. Catalog with valuable coupon sent only for 6 cents in stamps or coin. (No postals answered.)

VOLTAMP ELECTRIC MFG. CO., Voltamp Block, BALTIMORE, MD.

ELECTRICAL TOYS FOR BOYS

SOME CHRISTMAS SUGGESTIONS

SCIENTIFIC ELECTRICAL NOVELTIES

Practical, Complete, Durable, Harmless



EVERY boy in the country can easily own a railroad. Costs little and pays big dividends in fun. Our Models of Locomotives, Trains, Trolley Cars, Dynamos, Lamps, etc. are practicable and durable inventions. Equipped with dry batteries, no acids or liquids used, perfectly safe and harmless. Electrical toys instruct as well as amuse.

Catalog B, fully illustrated, quoting low prices—SENT FREE.

THE CARLISLE & FINCH CO.

262 E. Clifton Ave., Cincinnati, Ohio

Largest Manufacturers of Electrical Novelties in the World.

Electrical and Wireless Goods

of Recognized Quality and Merit

At Prices That Will POSITIVELY SAVE YOU MONEY

Our prices to consumer generally
LOWER than most dealers' cost.

Our New Big 250-page Catalog JUST OUT

Contains the most elaborate and complete line of Wireless Goods extant. It is full of electrical and wireless information, wireless diagrams, etc. Wireless section alone contains 80 pages of wireless instruments for commercial installation and experimental use.

Catalog mailed only upon receipt of 6 cents in stamps or coin

which may be deducted on first order of \$1.00. Our exceedingly low prices make it commercially impossible to send this elaborate catalog without the postage, which is our only means of knowing those interested in our goods.

The special prices quoted on margin of this page cease December 25th. Patrons must refer to this advertisement when ordering at special prices.

WHAT OUR CATALOG CONTAINS:

80 pages Wireless Instruments

25 pages Motors and Dynamos

10 pages Mirrosopes

15 pages Launch Lighting Outfits

8 pages Celebrated Union Shot Guns

15 pages Flash Lights and Miniature
Lamps

6 pages Medical Coils

5 pages Transformers

20 pages Telegraph Instruments

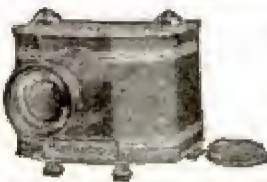
25 pages Miniature Trains



We Carry a Complete Line of Trains



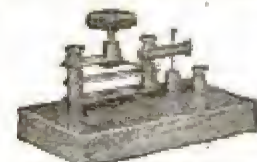
16 light Xmas Tree
Outfit for use on 110
volt current.
Sold elsewhere at \$8.
Special Price \$4.75



No. 209 Mirroscope
Only \$2.50



8 1/2 in. long
Miner's Flash Light
with Mazda Lamp
and Tungsten Battery.
Sold elsewhere
at \$2.50
Special Price \$1.65
Postage 22c



Celebrated Ferron
Detector.
Regular Price \$8.50
Special Price \$7.00



The most
up-to-date book
on wireless
yet published.
Contains all
the latest
diagrams.
Every wireless
experimenter
should have it.

Wireless Book
by V. Laughter.
Regular Price \$1.00
Special Price 75c
Postage 9c



Standard One-inch
Spark Coil
for Wireless
Sold Everywhere
at \$5.00
Special Price \$4.15



Blitzen Transformer
for Wireless.
Magnetic Leakage Type.
High Power Factor.
A Year's Guarantee.
1-4 K. W. . \$15.00
1-2 K. W. . \$22.00



Celebrated Western
Electric 2000 Ohm
Head Set.
The equal of any
\$12.00 Head Set made
Special Price \$6.75

and a complete line of electric lighting plants, washing machines, sewing machine motors, Xmas tree outfits, magnet wire, mechanical tools, electrical books, and in fact anything and everything in the field of Electrics.

You Cannot Afford to be Without This Catalog

J. J. DUCK, 424-426 St. Clair Street, Toledo, Ohio

HOLIDAY BARGAINS



- No. 2. Complete Electric Train Outfit, consisting of Locomotive, Tender, 2 trailers, and set of third rail track (2 straight and 4 curved). Will operate on 1 or 2 dry cells. Holiday price, complete, by express **\$1.85**
 No. 3. Same Outfit with Electric Headlight..... **2.35**
 No. 9. Larger Locomotive with headlight, larger trailers, and 4 sections straight and 4 sections curved track. Price complete..... **3.90**
 Extra sections (1 foot) third rail track **.15**
 No. 12. Locomotive DeLuxe, Tender and 38 in. circle track, made of brass nickel plated throughout, with an electric headlight, 17 in. long, 5 in. high, track 2 in. wide. Price Engine, Tender and Track.... **\$8.75**
 No. 15. Freight Outfit. Same engine and tender with gravel, cattle car and caboose **\$11.25**
 No. 18. Passenger Outfit, 2 Day Coaches **11.50**
 Extra straight track **.20**



Acetylene Moving Picture Machine. Throws a 5x5 picture 20 feet. 500 candle power. Safer than kerosene oil. Regular price, \$10.00.

Our price, with 5-ft. film..... **\$4.35**

Complete Wireless Outfit. Will receive 50 miles, and send two miles. Consisting of Auto Coherer, Receiver, Fixed Condenser, Double Slide Tuning Coil, 1 inch Spark Coil, Rheostat Regulator, Key, Spark Gap, and

1 pound aluminum wire. Will operate on from 4 to 6 dry cells, and can be tuned perfectly. Regular price \$11.50. Special, by express.... **\$9.35**

Electric Engine Outfit. Red Seal battery, engine and water bucket. By Express..... **\$.95**

With extra piece of shafting and wind-mill added..... **1.35**

Engine only..... **.60**

Nickle Tungsten Flashlight, with (new process) Merchlor Battery, and enameled Tungsten Bulb. Price by mail postpaid..... **\$.95**

In silver finish..... **\$1.35** In gold finish **1.50**

Extra Battery (Merchlor).... **.25** Extra Tungsten Bulb (flat)..
Automatic Pocket Cigar Lighter...... **.45**

Send 4c in stamps for our 3 Catalogs describing Electric Trains, Electrical Toys, Christmas Tree Electric Lights, Wireless Supplies

ANDERSON LIGHT & SPECIALTY CO.
 KNOWN AS LASALLE LIGHT STORE
 140 No. LaSalle St. Dept. A CHICAGO, ILL.



GROW MUSHROOMS

For Big and Quick Profits

I am the largest grower in America. Fourteen years' experience enables me to give practical instruction in the business that will add **\$5 to \$60 per week** to the income of any man or woman in spare time.

No matter what your occupation is or where you are located, here is an opportunity to acquire a thorough knowledge of a business that pays better than any other on earth.

Send for free book giving particulars and information, how to start, cost, etc. Address

JACKSON MUSHROOM FARM

6282 N. Western Avenue

Chicago, Illinois

Brick owes its color to the presence of iron in the clay from which it is formed. Usually 5 or 6 per cent of oxide of iron (ferric oxide) will give a deep red color to brick, a higher percentage giving a deeper color. The presence of carbonates of lime and of magnesium will modify the color.—Brick.



How to Entertain Book with 250 Jokes and Riddles, 73 Toasts, 67 Parlor Tricks, 8 Fortune-Telling Secrets, 52 Money-Making Secrets, 22 Funny Readings. All 10c Postpaid.

J. C. DORN, 709 So. Dearborn St., Dept. 17, CHICAGO, ILL.

Hundreds of Lives Lost Unnecessarily in the Austin Dam Disaster! Because of Lack of Warning



Had there been a wireless operator well equipped with a pair of **Holtzer-Cabot Sensitive Receivers**, to give his "C.Q.D." Warnings, the Death Knell would not have tolled so long.

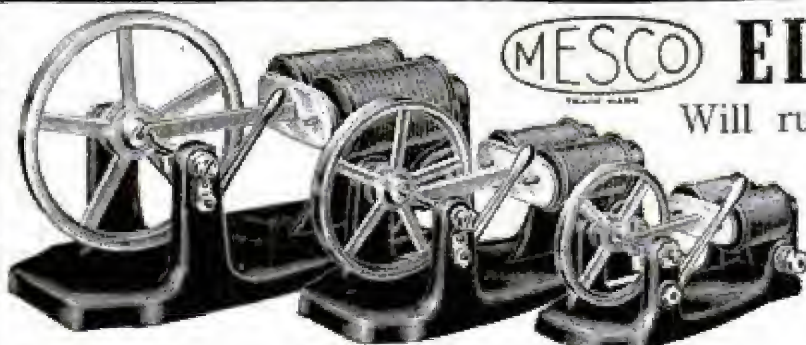
The success of our wireless receivers is proven by the numerous testimonials from our customers.

SEND FOR PAMPHLET 20Y2

The Holtzer-Cabot Electric Co.
 6161-65 So. State St. CHICAGO, ILL.
 Brookline, Mass.

AGENTS

Here's a winner. Get busy. Wonderful invention. The Easy-Wringer. Every woman buys. Think of it! A self-wringing mop. No putting hands into dirty water. No soiled clothes. Can use scalding water containing strong lye. Two turns of crank wrings out every drop of water. No talking necessary—just show it and take the order. Agents coining money. WRITE FOR FREE BOOKLET AND INFORMATION TODAY.
THE U. S. MOP CO., 1441 Main Street, LEIPSIC, O.



MESCO
 TRADE MARK

ELECTRIC ENGINES

Will run at variable speeds, between 200 and 3000 revolutions per minute. Both speed and reverse are governed by the controlling lever.

Can be run on one, two or three cells of Dry Battery. A Dry Battery equal to the Red Seal will operate one of these engines for days, as they are very economical in the use of battery current.

Our manual of Wireless Telegraphy mailed on request. Ask for Catalog 24P

List No.	Length	Width	Weight	Fly Wheel	Price
1011	7 in.	3 1/2 in.	45 oz.	3 1/2 in.	\$1.25
1012	5 3/8 in.	2 1/4 in.	22 oz.	2 3/8 in.	1.00
1013	4 in.	1 3/4 in.	10 oz.	2 in.	0.60

MANHATTAN ELECTRICAL SUPPLY CO.

NEW YORK
 17 Park Place

CHICAGO
 114 S. Fifth Ave.

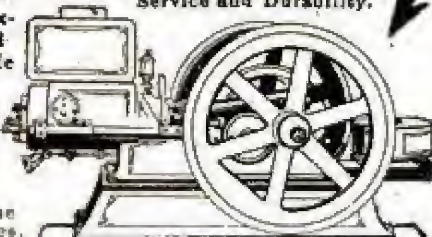
Cheaper Power for Every Purpose

The **WATERLOO BOY GASOLINE ENGINE** will run all day without attention, furnish exactly the power you need, maintain a uniform speed and save you money every hour it works. Uses either **Kerosene or Gasoline for fuel—equipped for both at no extra charge**

The recent award of **Gold Medal** at Budapest, Hungary, in open competition with the best engines of all countries is clinching proof **Waterloo Boy leads the World** in Construction, Power, Service and Durability.

Has many important exclusive features—Speed Lever works like throttle on a locomotive; old reliable fly ball governor, automatic feed regulation, open jacket, starts easy in winter, interchangeable parts, etc.

Lowest in price because made in largest quantities, at low manufacturing cost. **Guaranteed 5 Years.** Book free. Write today. **Waterloo Gasoline Engine Co.**

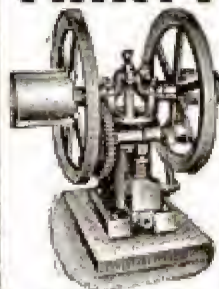


Awarded Gold Medal First Prize at the International Gasoline & Oil Engine Show Budapest, Hungary

1021 W. 3rd Ave. Waterloo, Iowa.

STOP! STOP! STOP!

THIRTY DAYS TRIAL of



United States Bonded Engine.

Burns gas, gasoline, kerosene, distillate. Consider these

12-ADVANTAGES-12

1st, Pays for itself in fuel saving in short time. 2nd, No violent vibration. 3rd, Greatly reduced bulk. 4th, Easily portable; mounted anywhere. 5th, Every engine part and horse power guaranteed. 6th, Absolutely frost proof. 7th, Positively most economical running engine made. 8th, Only engine with pulley on both sides. 9th, Small pulley on cam shaft, for very slow machines. 10th, Perfect Lubrication, cooling and ignition. 11th, Lowest cost engine in the world. 12th, Made by reputable firm, 60 years in business.

2 to 50 H. P. Wonderful New Pumping Engine. Send postal today for Illustrated Catalog.

United States Engine Works 1536 Canal St. CHICAGO, ILL.

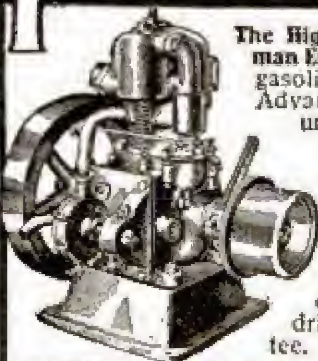
GOLD BARS FOR CHILD BRIDES—Little Indian brides, sometimes babies of 2 years old, cause the gold bullion exports from England, at the times of their marriage, to increase by \$150,000 a week.

The gold which is sent to India from England is made into various ornaments, etc., as presents for the brides.

The system of present-giving is as follows: All the relations of both bride and bridegroom shower gold

Rife Automatic Hydraulic Ram Pumps water by water power. No attention; no expense; 2 feet fall elevates water 50 feet, etc. Guaranteed. Catalogue free. **RIPE RAM COMPANY 231 Trinity Building, NEW YORK CITY**

POWER For all Purposes



The **High Powered, Light Weight Cushman Engine** measures out just enough gasoline to do the work required. Advanced 4 cycle type. Weight under 200 lbs. 4 h. p. rating but actually develops over 5 h. p.

AUTOMATIC THROTTLE GOVERNOR WITH HIGH GRADE SCHEBLER CARBURETOR

Easy speed changing is but one of several marks of superiority. Special friction clutch pulley with belt and chain drive. Sold on 10 year guarantee. Write for booklet.

CUSHMAN MOTOR WORKS, 2068 N. St., Lincoln, Neb.

Big Profits In This Little Engine For You

This is **Tom Thumb**—one of the famous engines in the **I H C** line.

Tom Thumb develops more than one-horse power. In the shop it will operate a lathe, drill-press, emery grinder, air compressor or other small machines. It is powerful enough to pump all the water needed on the ordinary farm—will run the cream separator, grindstone, bone cutter, churn, small corn sheller, washing machine, etc.

This little work saver is exceptionally simple and strong and will give steady, economical power for years. It is an **I H C** through and through. It is made of the same high grade materials and is built and tested in the thorough manner that distinguishes all

I H C Gasoline Engines

Tom Thumb comes all complete, including governor, spark plug, batteries, tools, etc. No water tank is needed. The cooling is done by air.

Write for more information about **I H C** engines. They are made in many styles and sizes, for every need. One to 50-horse power, stationary or portable; air or water cooled; built to operate on gas, gasoline, kerosene or distillate. Also gasoline and kerosene tractors, 12 to 45-horse power.

Write now for catalogue and any special information you desire. Address

International Harvester Company of America

(Incorporated)

16 Harvester Bldg. Chicago U S A



Please Mention Popular Mechanics

Power Users

Save money and time and buy your equipment from the manufacturer. For anything in the line of appliances for transmitting power—"Jones Service" and goods are unparalleled. We are the largest manufacturers of Machine Moulded Pulleys in the United States. No order too small for attention. No order too large to execute. Our Catalogue A-18 shows our complete line. "Jones Service" is

Prompt
Shipments
Reliable
Goods
Right
Prices

In Power Transmitting Machinery. If you are not getting it—order direct from our factory. We are extensive manufacturers of Machine Moulded Pulleys, gears, hangers, shafting, bearings, belting, friction clutches, sprocket wheels and chain belt.

**W. A. JONES
FOUNDRY &
MACHINE CO.**

MAIL ORDER
DEPARTMENT

1400 North Ave., Chicago, U.S.A.

**ALL AROUND
Jones Service
Is Unequaled
IN EVERY WAY**

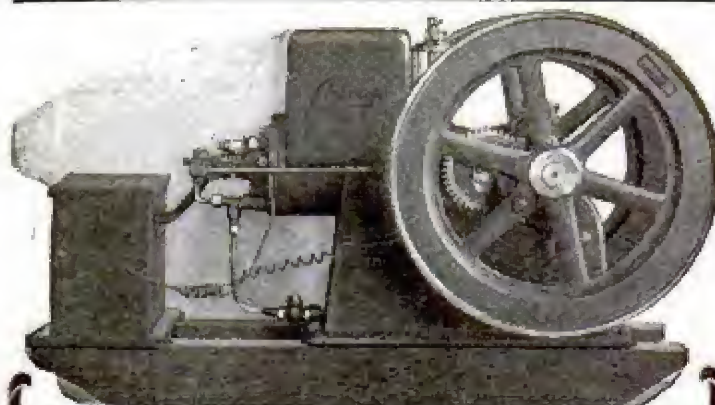
Factories, Mechanics, Shop, Laboratory or Home



ALL—Everybody ought to KNOW and HAVE this GAS ENGINE.

The Plunket Jr. The engine that makes good always. The best 1-2 horse power high grade Gas or Gasoline Engine on the market today. IT IS SIMPLE, EFFICIENT AND DURABLE (equal to two extra men about the place); is perfectly governed by throttling governor and a wide range of speeds is always at operator's command. Write now. Today. Send for circular and prices. Free for the asking.

J. E. PLUNKET, 1342 W. Lake Street, CHICAGO



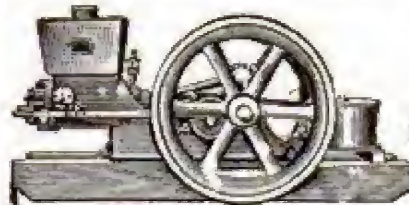
Get Our Price First Don't buy until you get our prices and catalog describing our line of high grade
CHICAGO GASOLINE ENGINES

You want the best at the lowest cost—investigate the construction simplicity, reliability of the "Chicago"—none better. Save 1/3 usual cost. Sold on Free Trial. Five year guarantee. Sizes 1 to 14 h. p. Write to-day.

COLBORNE MFG. CO., 410 W. Indiana St., CHICAGO, ILL.

"Caldwell Special"

**60 Days
Trial FREE**



Prove it on your own premises—that it saves time, saves labor and makes money.

The "Caldwell Special" is as clean cut as a race horse. Built right—works

right. Simply built—always gives full H. P. Costs little to run—big profit producer to pump water, run cream separator, shred or grind corn and a dozen other things.

Write any or all the 8 Banks of Waterloo as to our responsibility. Sixty day Trial Free. We prove it to you on your own premises at our expense that you cannot afford to do without a "Caldwell Special."

CALDWELL-HOLLOWELL MFG. Co.

514 Commerce Street, WATERLOO, IOWA.

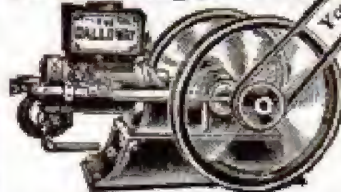
\$50 to \$300 SAVED

We are manufacturers, not merchants. Save dealers', jobbers' and catalog house profit. I'll save you from \$50 to \$300 on my High Grade Standard Gasoline Engines from 2 to 22 h.p. — Price direct to you lower than dealers or jobbers have to pay for similar engines in carload lots for spot cash.

GALLOWAY

Price and quality speak for themselves and you are to be the sole judge. Sell your poorest horse and buy a

5-H.-P. only \$119.50



**Direct
From My
Factory on
30 Days'
Free Trial.**

Satisfaction or money back. Write for special proposition. All you pay me is for raw material, labor and one small profit. Send for my big **BOOK FREE.**

WM. GALLOWAY, Pres.

WM. GALLOWAY CO.

1965 Galloway Station
WATERLOO, IOWA

ornaments, anklets, etc., upon the bride, and these become her dowry and absolute property throughout life.

It forms a sort of insurance against widowhood or family disasters. Should she require money she has simply to take the gold to a native bank or loan exchange and draw money on it.

All the gold bars sent to India are made into ornaments and jewelry of all kinds. During last year \$8,300,000 of gold bars were exported to India.—London Daily Mail.

WITTE ENGINES

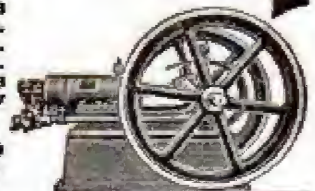
GAS—GASOLINE—DISTILLATE—NAPHTHA

Do the work at average cost of **One Cent** per horse power hour. Immense saving by our method of "pre-heating" the fuel. Built so perfectly that repairs cost less than \$1 per year average. Every valve is vertical and will not wear on the stem or slip inside. Freezing cannot injure bed as cylinder and base are separate. Hammered steel cranks, cut gears, etc.

GUARANTEED FIVE YEARS

We are experts in engine building; have done nothing else for twenty-six years. Our reference is thousands of satisfied customers. Our prices are right. All sizes, 2 to 40 H. P. Special inducements to introduce in new localities.

Write for free catalog stating size wanted.



WITTE IRON WORKS CO.

1654 Oakland Avenue, Kansas City, Mo.

DON'T BUY A GASOLINE ENGINE

until you investigate "The Master Workman," a two-cylinder gasoline, kerosene or alcohol engine, superior to any one-cylinder engine; revolutionary power. Its weight and bulk are half that of single cylinder engines, with greater durability. Costs Less to Buy—Less to Run. Quickly, easily started. Vibration practically overcome. Cheaply mounted on any wagon. It is a combination portable, stationary or traction engine. SEND FOR CATALOGUE THIS IS OUR FIFTY-NINTH YEAR.

THE TEMPLE PUMP CO., Mfrs., 442 West 15th St., CHICAGO

Make a Motor Boat of Any Boat in Five Minutes



You can do it with the Waterman Out Board Motor, which you can quickly attach (and detach) to the stern of any skiff, rowboat, dinghy, punt, sail boat, and have a good motor boat. It is not a toy, but a reliable 2 H. P. Marine Motor that will drive an 18-ft. rowboat 7 miles an hour, 4 hours on one gallon of gasoline. Simplest motor made. Weight 40 lbs. Six years successful results behind it. Canoe and larger motors—light weight models K and B

—LIFE GUARANTEE.

WATERMAN MARINE MOTOR CO.
1507 Fort St., West, DETROIT, MICH., U. S. A.

FAMOUS MICHIGAN SPEED WHEELS
REVERSE GEARS & MARINE HARDWARE

MOTOR BOAT MEN

Send for our large catalog of valuable information on speed wheels, reverse gears and marine hardware. Everything new and up-to-date.

Prices Right. Satisfaction Guaranteed
We carry an immense stock and can make you prompt shipments and save you money. Send for our free catalog today

MICHIGAN WHEEL COMPANY
545 Canal Street, GRAND RAPIDS, MICHIGAN

THIS SOLID EARTH A JELLY—The "solid earth" is evidently a misnomer; at least, two German scientists claim that the land is almost as unstable as the sea.

They, by a long series of observations, have proved that the earth has regular waves. In Germany these oscillations are extremely small, have a duration of between three and 10 seconds, and seem to have some relation to



WATKINS' SPECIAL MOTORS

3 H. P. Single Cylinder . . . 30 lbs.
6 H. P. Double Cylinder . . . 40 lbs.
12 H. P. Four Cylinder . . . 100 lbs.
A strictly HIGH GRADE Motor that will give CONSTANT and EFFICIENT service. Especially adapted for CANOES and LIGHT BOATS. Aluminum base, copper water jacket, steel shaft, bronze bearings.

THE WATKINS MOTOR CO.

837-839 West Sixth Street CINCINNATI, OHIO

ELLIS ENGINES

"GUARANTEED SERVICE"

Run on gasoline, kerosene, distillate, any cheap fuel oil. Cost less to run—develop more power. Patent throttle gives three engines in one. Many other exclusive features—guaranteed 10 years—we pay freight—30 days free trial. Send for catalog today.

ELLIS ENGINE CO., 3 Mullett St., Detroit, Mich.



Put a Fairbanks-Morse Engine In Your Boat

It means no starting trouble neither in winter nor summer, no cranking.

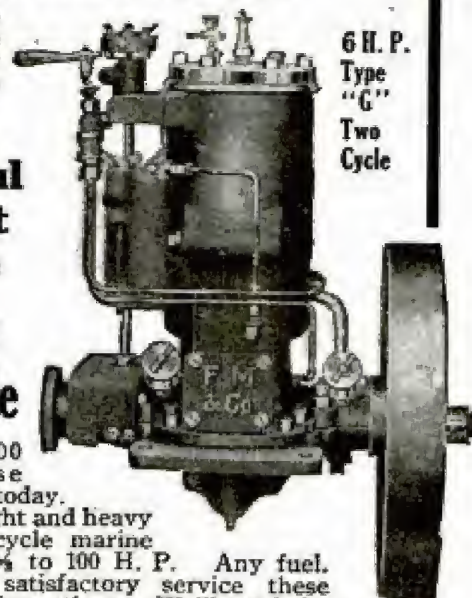
Engines are,

**Powerful
Efficient
Durable
Fair Price
High Grade**

Over 110,000 Fairbanks-Morse Engines in use today.

All types of light and heavy duty, 2 and 4 cycle marine engines from 3/4 to 100 H. P. Any fuel.

Learn what satisfactory service these engines are giving others. We'll send the proof. Send a card today. Ask for catalog No. 449CO.



6 H. P.
Type
"G"
Two
Cycle

Fairbanks, Morse & Co.

900 S. Wabash Ave.

Chicago, Ill.

BUY NOW! K. D. DORIES TOPPAN BOAT MFG. CO.
FREE Circular 2 Haverhill St., Boston, Mass.

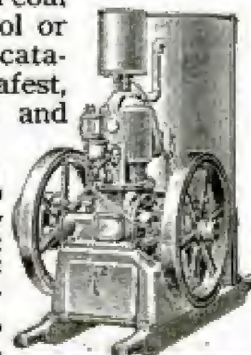
MIDDLEDITCH Kerosene ENGINES

Operate perfectly on common coal oil, gasoline, distillate, alcohol or any similar liquid fuel. Our catalog explains why this is safest, simplest, most economical and practical power.

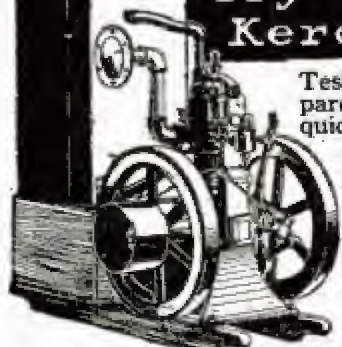
GENUINE FREE TRIAL

If it doesn't satisfy you in every way the trial costs nothing. Don't invest in any engine until you get our proposition. Write for it now.

THE MIDDLEDITCH ENGINE CO.
105 Meldrum Ave., DETROIT, MICH.



Try the Wonderful Columbia Kerosene Engine at our Risk



Test it out on your own place for fifteen days. Give it the hardest engine test you can think of. Compare it with any other engine. If the Columbia doesn't develop more power at less cost, send it back quick. No conditions. We are willing to let you be the judge and jury. Kerosene (common lamp oil) is by far the cheapest fuel today. The price of gasoline is climbing all the time, while kerosene remains the same, and in the right engine it lasts longer and produces more power per gallon than gasoline. You get ALL the power when you use a Columbia, because it is the right engine, it is the one really simple and perfect kerosene engine. It never bucks when you need it most. It is always on the job.

Write for Particulars of Our Big Special Offer

We are going to double our output for next year. We can do it easily. It is just a matter of getting engine users to test the Columbia for themselves. So we are making a great special money saving offer on Columbia Kerosene Engines. This offer is liable to be withdrawn at any time, so write today for full particulars, for it is a money saver you would hate to miss. Free Book No. 17 full of engine facts you need to know, sent free.

Sizes 2 to 16 H.P.
COLUMBIA ENGINE CO., 17 Fuller St.

DETROIT, MICH., U. S. A.

ROBERTS MOTORS

THE MOTORS THAT NEVER BACKFIRE

AEROPLANE

MOTORS THAT INSURE SUCCESS



C. O. HADLEY, FLYING WITH HIS ROBERTS 4X-50 H. P. AVIATION MOTOR, AT MINEOLA, N. Y.

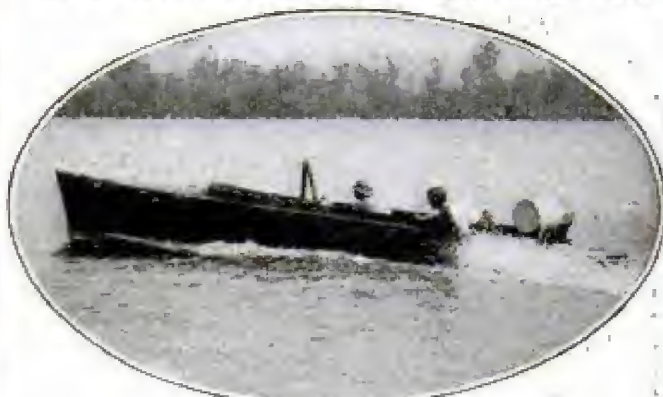
Over fifty motors in actual flight

Two sizes—4 cylinder 50 H.P., 6 cylinder 75 H.P.

Ask for our Aero Motor Catalog

MARINE

MOTORS THAT GIVE REAL SERVICE



PIRATE II 40 H. P. ROBERTS

The power plant of Pirate II is a ROBERTS 4P-40 H. P. motor which was built in 1908. Four seasons of constant racing service have proven the real worth of ROBERTS quality.

Built in ten sizes. 3 to 125 H. P. 1 to 6 cylinders
Our Marine Motor Catalog will be mailed upon request

THE ROBERTS MOTOR CO., 1419 Columbus Ave., Sandusky, Ohio

BAY STATE MOTORS



"Perfect Simplicity" and "Simple Perfection" are the results, embodied in these Motors, of 15 years devoted to the developing of these essential characteristics, which enable us to put on the market a reliable and economical motor at a reasonable price. Write for catalog, stating size and type (2 or 4 cycle) of motor wanted. We also furnish castings for these motors.

BAY STATE MOTOR WORKS

Successor to
A. J. HOULE MOTOR WORKS

580 South East Street, HOLYOKE, MASS.

GRAY MOTORS

6 HORSE POWER COMPLETE \$89⁵⁰

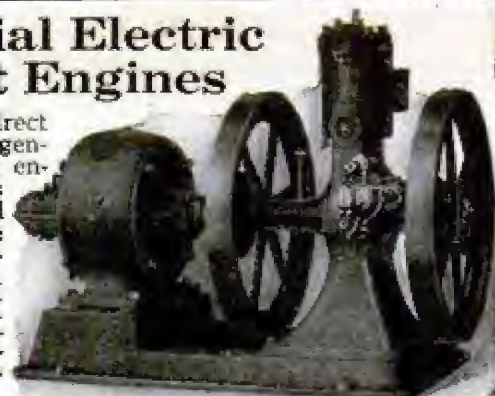
1, 2 & 3 Cylinders, 3 to 36 H.P.

Absolutely
Guaranteed by a
RESPONSIBLE concern.

Write for complete catalog—tells all about how these high grade motors are built in the largest plant in the world—devoted exclusively to the manufacture of 2-cycle motors. Gray Motor Co., 1292 Woodward Ave., Detroit, Mich.

Special Electric Light Engines

Complete direct connected generator and engine. Lights cabin and house boats, cottages, etc. Charges batteries. Capacity 16 C. P. — 6 amperes—voltage as required.



Termaat & Monahan Co., Dept. A, Oshkosh, Wis.

the waves of the North sea.

The most curious discovery was that the seismograph at Goettingen shows very irregular oscillations of the earth, having periods of from three-quarters of a minute to three minutes, which have some sort of a connection with the forests of southeastern Europe. These oscillations are at a maximum at 6 o'clock in the morning and diminish until 3 in the afternoon.

Even the wind has set up vibrations in the soil that the instruments are delicate enough to detect.—Boston Globe.

12 H. TOLEDO \$164⁰⁰
P. MOTOR

Including Schebler Carburetor and complete electrical and propeller outfits. 2 cycle, 2 port. From 3 to 18 H. P., 1 to 3 cyls. Fully guaranteed. Simple and reliable. Send for our large catalog "C" at once.



THE UNIVERSAL MACHINE CO., Pike Ave., BOWLING GREEN, O.



DON'T BE BALD

Don't be prematurely gray. Stop your hair falling. Use our **Hygienic Vacuum Cap** at home a few minutes each day. It forces circulation of blood through the hair roots. It means perfect health for the hair. Endorsed by the leading physicians. 30 days free trial. WE SUBMIT PROOF. BOOKLET FREE.

HYGIENIC VACUUM CAP CO.
513 D Sibley Bldg., Rochester, N. Y.

3 BEAUTY POSES 25c.

Decorate your "Den" with "Art Gems"

Exquisite portrayals of female loveliness. 3 bewitching poses 25c; 6 for 50c. One 6 1/2 x 8 1/2 photograph free with every order for six.

Our Dollar Special: Two 6 1/2 x 8 1/2 photographs, 6 cabinet size and 32 small photos, all for \$1.

Our pictures are all real photographs. No reproductions of paintings or other cheap trash. Money back if not pleased.

ART PHOTO CO., 2012 P.M., Grand Rapids, Mich.



\$97⁵⁰ PER CARAT**GENUINE PERFECT CUT LEGALLY GUARANTEED DIAMONDS \$97⁵⁰ PER CARAT****This World's Lowest Price**

places a beautiful genuine brilliant Perfect Cut Diamond within your means. We save you the profits of many middlemen, by importing diamonds and selling them direct to you. Our popular methods have given us a volume of sales that makes it impossible for any retail jeweler to meet our price. Retailer's price from \$135 to \$175 per carat. Compare this with our prices on the arrow. Every diamond guaranteed in writing to be Genuine, Perfect Cut, fine Quality, and wonderfully brilliant.

Diamonds the Ideal Gift

Give a diamond for Christmas, engagement, birth-day or wedding present. Nothing expresses regard so permanently or perfectly. Always in perfect taste. A size for any price. Read our handsome Diamond Book (Free) for Gift Suggestions.

The Basch Plan of Selecting a Diamond

(by mail) makes disappointment impossible; because no payment or deposit is required until after you see the diamond and are absolutely satisfied. We pay all expenses. You incur no obligation whatever in sending to us for a diamond. Every diamond selected by the Basch Plan is separately priced from the gold mounting. Read about the Basch Legal Guarantee that protects you from loss or dissatisfaction. Full particulars in our Diamond Book (Free).

We State and Guarantee the Carat

Weight of every diamond, making the price and value perfectly plain. Beware of buying a diamond priced complete with the mounting! Concealing the carat weight is a trick to conceal a high price. Our Diamond Book (Free) contains full details for your protection in buying a diamond.

No Delays! Your request for any diamond, or for our Diamond Book (Free) acted on the day received. No waiting for deposits or references—the Basch Plan requires neither.

Send No Money Write Today

Our Legal Money Back Guarantee

issued with every diamond, is a contract to refund 90% in cash, any time, for any reason. Also to accept any diamond we sell for exchange, with credit of Full Purchase Price. Also certifies true carat weight, quality and value of every diamond. Made out in your name and signed over our seal. Our guarantee safeguards your investment, and gives you protection that pleases.

A Personal Word Our low price, \$97.50 per carat, has introduced us to thousands of people in every community. Established 1879, 33rd successful year. We own and operate one of the largest and best known jewelry stores in the world, at the below address. Reference, the publishers of any magazine, any Express Co., bank or Com. Agency, and Union Bank of Chicago.

Prices of Articles Here Shown:

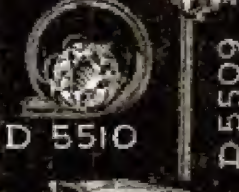
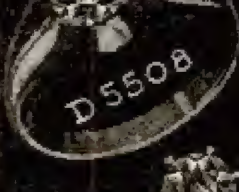
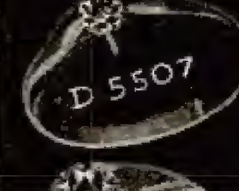
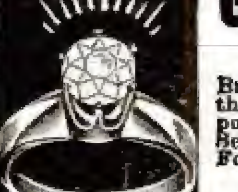
D5500—1c. dia. \$97.50; 14k solid gold Belcher ring \$5.00; complete \$102.50. D5501—1/4c. dia. \$56.25; 14k Tiffany style ring \$3.75; complete \$60. D5502—1/2c. dia. \$45; 14k Ladies' Belcher ring \$4.25; complete \$49.25. D5503—1/2c. dia. \$31.25; 14k Lion's paw ring \$5.75; complete \$37. D5504—Two 1/2c. dia. \$61.50; 14k Twin Tiffany style ring \$5; complete \$67.50. D5505—Two 1/2c. dia. \$125; 14k Tiffany style ear screws \$3; complete \$138. D5506—1/2c. dia. \$45; 14k Ladies' fancy ring \$4.75; complete \$49.75. D5507—1/2c. dia. \$17.50; 14k tooth style ring \$5.50; complete \$23. D5508—1/4c. dia. \$121.88; 14k tooth ring \$5.50; complete \$127.38. D5509—1c. dia. \$97.50; Tiffany style scarf pin \$5.00; complete \$102.50. D5510—1/2c. dia. \$67.50; 14k solid gold shirt stud \$5; complete \$72.50. D5511—1/2c. dia. \$36.25; 14k round Belcher ring \$5.00; complete \$91.75. Any mounting furnished with any size diamond.

You cannot buy a diamond safely or intelligently without

The Basch Diamond Book (FREE)

It has taken the experience of 33 years to prepare it. It contains helpful, protective information that you will certainly appreciate. Cover in 5 colors from oil painting by Spielberger, worth framing. Illustrates diamond jewelry (and nothing else). Choice of thousands of rings, pins, brooches, scarf pins, LaValieres, watches, cuff links, ear screws, bracelets, studs, etc., all in 14 karat solid gold. A copy ready to mail to you on receipt of your name. Get this authoritative Diamond guide, absolutely free; absolutely without obligation.

L. BASCH & CO., Diamond Dept. D-347 S. State St., Chicago



Fill out this Coupon NOW and receive our Diamond book Free by return mail
Please mail my Free Copy of your Diamond Book.

Name.....

Address.....

MAIL TO
L. BASCH & CO.
Dept. D-347 S. State St. Chicago, Ill.

BARODA DIAMONDS
Flash Like Genuine
ANY STYLE
at 1/40 the cost—IN SOLID GOLD RINGS
Stand acid test and expert examination. We guarantee them. See them first—then pay.
Special Offer—14k Tiffany ring 1 ct \$5.99. Gents ring 1 ct \$6.98. 14k Stud 1 ct \$4.88. Sent C.O.D. for inspection. Catalog FREE, shows full line. Patent ring gauge included, 10c. The Baroda Co., Dept. 45, Leland & Dover Sts., Chicago

**Geisha Diamonds**

THE LATEST SCIENTIFIC DISCOVERY

Bright, sparkling, beautiful. For brilliancy they equal the genuine, standing all test and puzzle experts. One twentieth the expense. Sent free with privilege of examination. For particulars, prices, etc., address

THE R. GREGO MFG. & IMPT. CO.
Dept. 11, 517 Jackson Blvd., Chicago, Ill.

ELEGANT THIN MODEL 20 YEAR WATCH
Hunting case, beautifully engraved, gold finished throughout, stem wind and stem set, fitted with 7 ruby jeweled American lever movement. Guaranteed 20 years; with long, gold plated chain for Ladies or vest chain for Gents. IF YOU SEE IT YOU WILL BUY IT. Let us send it without expense to you C. O. U. express charges paid by us, for examination at your nearest express office and if you think it a bargain and equal in appearance to any \$15.00 gold finished watch pay the express agent \$3.95 and it is yours. Mention if you want LADIES' MEN'S or BOYS' size. Address M. C. FARMER C13, 219 S. Dearborn Street, Chicago, Ill.



20 Year Guarantee

PIPE SMOKERS

Put one of these new pipe grates in your pipe and enjoy a comfortable smoke, made of the best white clay, stops the stem from clogging, absorbs the nicotine, burns every particle of tobacco and is easy to clean.



Pat. Appl. For

PRICE 10 CENTS

Linley Engineering Works, Fairfield, Conn.

CONGRESS CARDS

For Social Play - Art Backs - Exquisite Colors - High Quality.
New Designs - Club Indexes - Ideal for Bridge.
Gold Edges - Air-Cushion or Ivory Finish.

OFFICIAL RULES OF CARD GAMES - HOYLE UP-TO-DATE
ISSUED YEARLY - SENT FOR 15 CENTS IN STAMPS.
THE U. S. PLAYING CARD CO., CINCINNATI, U.S.A.

BICYCLE CARDS

In Use Throughout the World for General Play
The Most Durable 25 Cent Card Made.
Club Indexes - Air-Cushion or Ivory Finish.



Christmas DIAMONDS

MODERATE PRICES EASY TERMS

Delight the wife or sweetheart this Christmas with one of these popular Rings, set with perfectly cut blue white Diamonds, gleaming with sparkling light.

You can afford to own our plan, which is open to every honest person. You pay a small amount (usually one-fifth) when you have seen and accepted the Diamond; the balance in ten equal monthly payments, without interest. There is not a cent to pay for the largest Diamond in our Beautifully Illustrated Diamond and Watch Catalog SENT FREE until you have first examined the Diamond with the magnifying glass which we send with it, together with our binding Guarantee Certificate. We guarantee to please you, or the Diamond comes back at our expense.

We import the rough Diamonds and cut them here, saving the duty of 33 per cent, thereby offering you the pick of the mines at prices you cannot equal elsewhere.

Write today for our handsome catalog

The WALKER EDMUND CO.
DIAMOND IMPORTERS
Dept. C
205 S. State St.,
CHICAGO,
ILL.

105 \$40	106 \$35	109 \$60	\$30 108
\$50 110	\$140 112	\$25 107	

BE YOUR OWN BOSS

Make Money Easy

AGENTS wanted in every county to sell the popular Golden Rule Knives with name, address, photo, lodge emblems, etc., on handle. Agents earn \$75 to \$200 a month selling our shears, transparent handled pocket knives and razors. Big profits, quick sales. Exclusive territory. Experience unnecessary. WE TEACH YOU NOW.

Write today for terms and become one of our successful salesmen.

GOLDEN RULE CUTLERY CO., 362 Wendell St., Dept. 142, CHICAGO

New Idea HOSE SUPPORTER

Needed by every man. Holds hose firmly to underwear. Will not bind, slip, tear, rust, or retard circulation. Easily and quickly attached. No elastic, clasps or pins. Comfortable! A boon to those suffering with rheumatism. Warranted. Satisfaction or money back. Prices: Nickel, 25c pair, Gold, 50c. All dealers, or by mail. Descriptive circular free.

THE NEW IDEA CO. Dept. 1, TOLEDO, O.

WHY MARCHING IS HARD WORK—People are apt to think soldiers very poor walkers because an army on the march covers only 10 or 12 miles of ground per day. Even then a good many men fall out through fatigue, some faint, and all are completely done up at the end of the day.

But the soldier is, nevertheless, a first-rate walker. It is all a matter of foot-tons of energy expended. Take an ordinary laborer, and his day's work will be equal to

AGENTS EARN BIG MONEY EASY

\$20 to \$75 PER WEEK

Selling our Scientifically Tempered Knives, Razors, Shears. Handles decorated with name, address, photos, lodge emblems, etc. Guaranteed against break or defect. They cut and hold an edge. Sell on sight. Write quick for territory.

Canton Cutlery Co., Dept. E 51 Canton, O.

Lessons in Mounting Birds Free



Yes, we will send you a lesson just as it is given by the famous Northwestern School of Taxidermy, absolutely free and prepaid. No obligations whatsoever. It teaches you something that every sportsman, hunter and nature lover should know.

LEARN TO MOUNT BIRDS AND ANIMALS

Save your fine trophies. Learn how to mount them yourself. Every hunter, sportsman and nature lover should know how to mount birds and animals. Decorate your home, your office or your den with your beautiful trophies. Do not pay taxidermists exorbitant prices for mounting them for you. Do it yourself FREE. Or you can make big money mounting for others.

Big Money

You to enroll now.

Yes, you can easily make \$50 a month during your spare time, or \$3,000 to \$5,000 a year if you go into the profession. 35,000 successful graduates, every one an enthusiastic taxidermist. We want you to enroll now. We teach you in your own home—during your spare time—by mail. Success guaranteed.

Free Book

If you write at once we will send you our handsome new book on taxidermy as well as the free lesson. It tells you all about this most fascinating profession, and all about our school and how we teach you to become a taxidermist by mail. We will also send you the handsome taxidermy magazine, all free and prepaid, if you write at once. No obligations whatsoever. Write NOW—before you lay aside the paper.

NORTHWESTERN SCHOOL OF TAXIDERMY, 1199 Harney St., OMAHA, NEB.

Corner the Fun Market!

Box Ball has taken fun lovers by storm—is cleaning up from \$100.00 to \$600.00 a month clear profit for Managers everywhere. One man with four alleys made clear

\$680.00 in 30 Days

Be a Manager. All you need is energy, and on a small investment you can make the same profits, if not greater ones, right in your own locality. Box Ball is a clean, moral game—an exercise that fascinates the best class of men and women everywhere. New improved alley—noiseless, fast, irresistible. Big, regular shaped ten-pins set automatically by the players—you just take in the cash. No help needed to operate—no expenses of any kind except rent.

Our Guarantee—you can set yourself up in a permanent, big-paying business on an investment as low as \$130 to \$300. If you are not satisfied after 30 days we take back the alley and refund what you paid us minus what you took in. Write for our proposition at once.

AMERICAN BOX BALL CO., Box 364, Indianapolis, Ind.

NICKELITE

The new synthetic substance for nickel plating metals. It is a real electro-plate. NICKELITE is applied to the metal by hand with a wet rag. The process is electrolytic, but no apparatus of any kind is required. Price, 25 cents per box. Supplied by your dealer or will be sent postpaid direct from the manufacturer upon receipt of price. GORMAN MANUFACTURING COMPANY, HAZLETON, PA.



I will send as long as they last my 25 Cent Book **STRONG ARMS** For 10c in stamps or coin

Illustrated with 20 full page halftone cuts, showing exercises that will quickly develop, beautify, and gain great strength in your shoulders, arms, and hands, without any apparatus.

PROF. ANTHONY BARKER
644 Barker Bldg., 110 W. 42d Street, New York

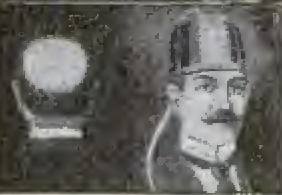
300 tons lifted one foot high. An average man, walking 17 miles on the level, does the same amount of muscle work. But mark, if he carries an overcoat weighing 6 lb., he does 311 foot-tons. Now the soldier is a regular pack-horse, and the kit that he carries averages about 60 lb. weight. So that he does exactly as much work in a 12 miles' march as an ordinary man in his 17-mile walk. Besides, the soldier has to "break camp"



Squab book **FREE**

Make money breeding squabs. Read in our 1912 free book how Etwinna Farms (N.Y.) sells them for \$6 doz. Started with 25 pairs of our Extra P. R. Homers two years ago, multiplied now to 800 pairs. John Landwig (Cal.) 75 years old, making \$25 week. Oscar Maerzke (Wis.) \$4000 yearly shipping squabs to Chicago. Big western demand. 5000 squabs wanted daily by only one N. Y. firm. See what they say in NATIONAL SQUAB MAGAZINE (monthly) specimen copy from us TEN CENTS, one yr. \$1. All about pigeons and squabs: handiest, largest, unique, original, practical. PLYMOUTH ROCK SQUAB CO., 229 Howard St., Melrose, Mass.

NO MORE BALD HEADS



When our VACUUM CAP is used a few minutes daily. We accept no pay until you have tried the Cap 60 days and are satisfied. The Vacuum Cap is an appliance that draws the blood to the Hair Roots and starts a new healthy crop of hair. It stops Dandruff, stops the hair from falling out. Bought by Doctors and men who

know that it is the only reasonable HAIR GROWER known to science. No Drugs Used. Write for application blank, testimonials, and booklet on "HAIR," sent sealed in plain envelope, FREE.

THE MODERN VACUUM CAP CO.

C. 559 BARCLAY, DENVER, COLO.



\$2.40

Takes the Superb New Model Edison

Give the new model Edison a thorough trial in your own home free—then, if you decide to keep it, send us \$2.40. The greatest phonograph offer ever made. And, just think—it is on the new model Edison—the instrument which Mr. Edison has just perfected after years of diligent research and experiment.

Free Trial Yes, you may have a free trial of this greatest of all phonographs in your own home. A genuine free trial. Take your pick of any of the scores of wonderful instruments and from thousands of records—I will send them to you free. No deposit, or C. O. D. payment to us whatsoever. Give your family, your friends and your neighbors all the entertainments of the big cities—grand opera, vaudeville, minstrels, waltzes, two-steps, brass bands, world-renowned orchestras, pealing organs, etc. All the world's greatest entertainers will come to your own home through the Edison. Hear all this entertainment FREE; then, if you wish, send the outfit back to us—and we pay the freight.

If you decide to keep the phonograph send us \$2.40 and pay the balance on the easiest kind of payments. Terms as low as \$2.00 a month without interest. And, remember if you write at once, you may obtain the rock-bottom price.

Send No Money—Send the Free Coupon

Do not send us a penny. Before you send us a cent, we want you to be convinced that the new style Edison is the greatest and best phonograph that you ever heard—we want you to hear all the wonderful entertainment free. Send the free coupon today for our handsome new free Edison book. It tells you all about the dozens of machines and the thousands of records that you have to select from. The book is absolutely free and prepaid—no obligation whatsoever. Write today, so that you may take advantage of the rock bottom price. We will send you our handsome new Edison book at once. Write today, do not delay, write now, while this greatest of all phonograph offers lasts.

F. K. BABSON

Dept. 1199, Edison
Block, Chicago, Ill.
Western Office: 65 Post St.
San Francisco, Cal.

Canadian Office:
255 Portage Ave.
Winnipeg, Can.

FREE

Catalog Coupon

F. K. BABSON

Dept. 1199 Edison Block,
Chicago, Illinois.

Please send your new Edison
Catalog and full particulars of
the \$2.40 offer made here.

Name

Address

ELGIN WATCHES ON CREDIT

CHRISTMAS SPECIAL! \$16⁵⁰



P. STEPHEN HARRIS, Pres.

I want to send you a free copy of my latest book "Facts vs. Hunch" or all about the Watch Business, both at home and abroad.

17-Jewel Genuine Elgin in a 20-year Gold Filled Case—sent Prepaid on Free Trial at our Rock-Bottom Wholesale price of only

Let us send you this beautiful 17-Jewel Elgin Watch, complete in 20-Year Gold-Filled Case

No Money Down—\$2 A Month

\$2.50 AFTER EXAMINATION.

You assume no risk in dealing with us, because, before you buy

or pay one cent we place the watch right in your own hands and let it do its own talking. We ask NO SECURITY and NO INTEREST—just plain honesty among men. Our Elgin Watches are so well known and our CREDIT PLAN so easy, that no matter where you live or how small your wages, WE WILL TRUST YOU, so that you and every honest man and woman can own a DIAMOND or High-Grade Elgin Watch in a beautiful Guaranteed 25-year Gold Filled Case and wear it while paying for it in such small payments that you never miss the money. Write Today for Our Big Free Watch and Jewelry Catalog. It tells all about our easy credit plan and how we send Elgin 19-Jewel B. W. Raymond and 21 and 23-Jewel Elgin Veritas everywhere on Free Trial, without security or one cent deposit, positively Guaranteed to Pass Any Railroad Inspection.



1912 Catalog NOW READY ASK FOR IT.

HARRIS-GOAR CO., Dept. 294, KANSAS CITY, MO.

The House That Sells More Elgin Watches Than Any Other Firm in the World.

Send for free Catalogue



A SENSATIONAL MONEY-MAKER

The Automat machine makes a picture in less than 20 seconds, Automatically. It is the latest invention for street photography. No sleeve, no electricity, no magnetism, plain, simple and practical. It is very easy to operate, and full instructions accompany each machine. No experience is necessary. Our Wonderful Ferrotypesleeve Machines, best for professional use, \$15.00 and up. Regular Plates 1 1/4 x 2 3/4, 75c per 100. Mounts, 25c per 100. Postcards, 30c per 100. Button Plates for all button machines, 75c per 100. Brooches, 65c per Gross and up. Developer, 15c per set. All of our plates are Guaranteed. A deposit is required with every order. NEW YORK FERROTYPING CO. (Inc.), Dept. 72 168 1/2 Delancey St. New York City, N. Y.



Amazing Profits In Mushrooms

Anybody can add \$8 to \$40 per week to their income, in spare time, entire year growing mushrooms in cellars, sheds, barns, boxes, etc. I tell you where to sell, at highest prices.

Free Illustrated Instruction Booklet

HIRAM BARTON

Desk 2, 329 W. 48th St., New York

Your Picture in a Postal Card IN ONE MINUTE

The pictures are developed, toned and finished in a single developing solution. No experience is necessary. Price of machines \$7.50 and \$15.00—circulars describing our machines sent free. We are also headquarters for supplies for all minute picture machines.

AMERICAN MINUTE PHOTO COMPANY Dept. U, 728-728 W. 12th St., Chicago, Illinois The largest manufacturers and distributors of minute picture machines and supplies in the world.



before starting, and at the finish of the march he has to pitch camp, draw water, collect fuel, clean rifles, etc., not to speak of taking sentry-go. When, as sometimes happens, an army marches 20 miles, the day's work of the soldier is really two days' work, or about 600 foot-tons.

BIG MONEY FOR YOU

Selling our metallic letters for office windows, store fronts, and glass signs. Any one can put them on. Nice, pleasant business. Big demand. Write today for free sample and full particulars. METALLIC SALES CO., 406 No. Clark St., Chicago

HONEST MAN OR WOMAN WANTED

in every town to represent well-known wholesale firm. Experience unnecessary. Must furnish good references. Easy, pleasant work. Fair salary to start.

McLEAN, BLACK & CO., 701 Doty Building, Boston, Mass.

OVER \$400 Made in One Day

Operating the

CIRCLING-WAVE AMUSEMENT DEVICE Read this

Armitage & Guinn: At Engerton, Ind., away back from no place we got in \$350.00 in six hours' run. At Crawfordsville, Ind., we had a \$412 day.

BOOHER BROS.

IF BOOHER BROS. DID THIS, WHY CAN'T YOU? Let us tell you all about this marvelous CIRCLING WAVE, and its wonderful money-making power. Address,

ARMITAGE & GUINN, 34 Mill St., Springville, Erie Co., N.Y., U.S.A.



GO INTO THE Moving Picture Business

FROM \$45 to \$60 STARTS YOU AND YOU WILL EARN AS MUCH IN 1 OR 2 NIGHTS

The small payment required to get our machine will make more money than thousands of dollars invested in any other enterprise.

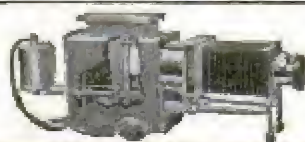
\$25 and more per night can be made exhibiting with our machine in halls, schools, churches, theaters, etc., in your own and surrounding towns. We furnish everything—rent films, too.

Write for particulars about our Moving Picture Machines and our 6-months-to-pay plan.



P. & W. SALES CO., 835 Temple Court Bldg., CHICAGO

Magic Lanterns with the Alco-Radiant Light



The Alco-Radiant is the only practical, intense light for Lanterns if electric is not to be had. It burns alcohol, costs little to use and a trifle to buy; weighs 3 lbs.; adaptable to any Lantern. New Lantern slides for Lenten season, plain or colored, for sale or rent. Lecture sets of slides with readings, such as Judas, Herod, The Multitude, Way of Grief, Seven Words from the Cross, Passion Play of 1910, etc. Ask About Post Card Projectors. They show on a screen the image reflected from a post card or any other picture or flat object. Prices, \$4.50, \$13.50, \$25.00, \$60.00.

WILLIAMS, BROWN & EARLE, Dept. 20, 918 Chestnut Street, Philadelphia, Pa.

WANT A JOB?

I want a good man in every territory in the United States, as local agent, or as general agent for a number of countries. This is a new proposition. The only successful invention of its kind in existence—an opportunity to make from \$45 to \$90 a week, and on up to \$8,000 or \$10,000 a year. No experience necessary, simply follow my instructions and do your level best. You are bound to succeed. The machine sells itself.

THIS IS YOUR OPPORTUNITY

H. C. Wingo sold 720 machines in six weeks, profit \$1080.00. Stauffer sent in third order for 300 machines. Stevenson averaging 30 sales a day. Kirgan sold six in ten minutes. It's great—the biggest, easiest, lightning seller of the age. Simply show and the sale is made. Grand free, advertising special introductory plan starts you in any territory as agent, salesman or manager. Over \$500 worth of goods given free to hustlers. Biggest holiday seller out. Women buy for presents to men. Give all or spare time. The machine is absolutely guaranteed to put any make, style or kind of razor in perfect shaving condition. No home required. Opportunity of lifetime. Field untouched. Agents coining money. Territory going fast.

\$45 to \$90 a Week

SEND NO MONEY

Simply send name and address on postal and get complete information, reports, together with my **FREE TRIAL OFFER**. You risk nothing—fortune is awaiting you. **INVESTIGATE.**

SECRETARY, THE NEVER FAIL CO.
1231 Colton Bldg.
Toledo, Ohio



PAVEMENT LIFTED BY MUSHROOMS—An illustration of the remarkable lifting power of mushrooms has occurred at Bristol.

An asphalt pavement in the St. Jude's district recently began to bulge upward, and soon afterward the heavy mass split in several places.

The cause of the upheaval was found to be growing mushrooms, of which some 2 lb. were gathered from a small space beneath the pavement.—London Daily Mirror.

HERE'S A GOOD ONE



The most successful picture machine on the market to-day makes 6 pictures in one minute. Our combination automatic and sleeve Wonderful Ferrotypes Machines have a double lens and one cup. Button plates are worked **Automatically**, and square plates $1\frac{1}{2} \times 2\frac{1}{4}$ and $2\frac{1}{2} \times 3\frac{1}{4}$ are fed by hand. It is also reversible for taking groups and is considered the best for general professional work.

A full line of street tintype supplies at moderate prices. Write to-day for our free circular and price list.

UNITED FERROTYPING CO.

78 Delancey St., Dept. 64

NEW YORK CITY, N. Y.

12 Art Panels 50c

Beautiful Duo Tint Reproductions of Famous Paintings—Panel Size 7x10

These pictures are real gems—the most exquisite portrayals of

"WOMAN BEAUTIFUL"

ever shown in one collection. We send a full set of 12 in handsome Art Portfolio, packed flat and safe delivery guaranteed, together with lifelike miniatures of 70 other beautiful and catchy den pictures, for only 50c; coin, money order or U. S. stamps. Send at once. Money back if not satisfied. Or send \$1.25 for same set hand-colored.

Florentine Art Company
Dept. U. 12, 2309 Prairie Ave., Chicago, Ill.

FREE Order panels at once and we will include Free a beautiful den picture in colors.



Please Mention Popular Mechanics

Yours for the asking



Complete Loose Leaf Library

Covering the entire subject of Loose Leaf Record Keeping

These books (200 pages) contain illustrations of 40 different record forms and fully describe their use: give full information how to start the Loose Leaf System and how to maintain it. They will show you how

Moore's Modern Methods

reduce office work and expense; why this Loose Leaf System is used by 60,000 progressive business houses today.

We shall be glad to send any business or professional man these books **without charge or obligation**. You cannot buy more complete information on Loose Leaf methods than we give you in this library. Fill out and mail the coupon with your business letterhead.

JOHN C. MOORE CORPORATION

ESTABLISHED 1839

713 Stone Street, Rochester, N. Y.

COUPON—Send me **FREE** your Loose Leaf Library

Name.....

Business.....

Address.....

2315 \$35.

4083 \$50.

2108 \$25.

2271 \$100.

2113 \$50.

2640 \$2.50

2546 \$8.

2121 \$100.

2184 \$45.

2198 \$25.



2132 \$60.

2317 \$25.

4081 \$16.

4082 \$100.

2110 \$35.

2678 \$7.50

2126 \$175.

2585 \$9.

2208 \$120

The Best of Xmas Gifts—A DIAMOND

Is there any gift for man or woman so acceptable, so much to be desired, or so permanently valuable as a really fine diamond?

If you wish to confer upon anyone this most beautiful of Christmas gifts or to have for your own use the very finest grade of Blue White stone in any setting you wish, our system of selling you

DIAMONDS ON CREDIT

At Lowest Importers' Prices

Brings our goods within reach of all.

We are one of the largest diamond dealers in the world. We import our stones in the "rough" and finish them here. We buy for spot cash in enormous quantities. Instead of counting on a few sales at big prices, we figure on a mass of sales at small profits. That's why we can sell you diamonds 20% lower than any other dealers.

We furnish diamonds on credit to any reputable man or woman on these terms:

20% with order and 10% per month.


You have the privilege of exchanging your purchase at its full value. All transactions strictly confidential. Any article here illustrated or in our catalog No. 8 sent express prepaid for your examination, returnable at our expense if not perfectly satisfactory.

Send at once for our beautiful 65-page Christmas catalog No. 3. It's free. Select your diamond before Christmas and get it on credit.

Special Holiday Discount of 10% on all Cash Purchases.

J. M. LYON & CO.

71-73 Nassau Street New York City



PRINT YOUR OWN

Cards, circulars, books, newspaper. Press, \$5. Larger \$18. Rotary \$60. Save money. Big profit printing for others. All easy rules sent. Write factory for press catalog. TYPE, cards, paper, &c. THE PRESS CO., Meriden, Connecticut

LE PAGE'S GLUE — STRONGEST AND HANDIEST
 Russia Cement Co., Gloucester, Mass.

(ESTABLISHED 1842)

Reed & Sons Pianos

Highest Award World's Columbian Exposition

Now Sold Direct to You from Factory

30 DAYS' FREE TRIAL IN YOUR HOME. Take your own time to pay. No payment in advance required. For free book address

REED & SONS PIANO MFG. CO.

Dept. C17 Cor. Jackson Blvd and Wabash Ave. CHICAGO

AMATITE ROOFING

Mineral surfaced. Needs no painting. Send for free sample.
BARRETT MANUFACTURING CO., New York, Chicago

CIGARS from maker to smoker, by mail, at wholesale price. Send for catalog. La Reforma Cuban Factory, 414A, E. 32d St., N. Y. C.



TYPEWRITERS

ALL MAKES

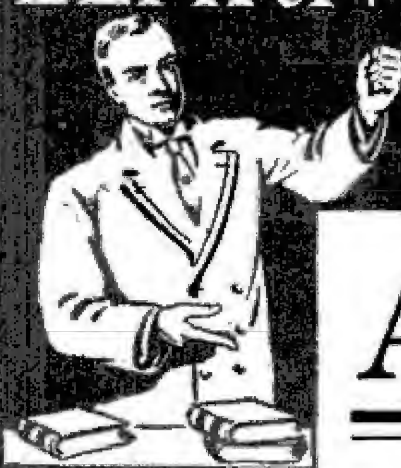
All the Standard Machines SOLD or RENTED ANYWHERE at 1/4 to 1/2 RETAIL PRICES, allowing RENTAL TO APPLY ON PRICE. Shipped with privilege of examination. Write for Illustrated Catalog L. TYPEWRITER EMPORIUM, 92-94 Lake St., CHICAGO

CACHOO! Make the whole family and all your friends "just sneeze their heads off" without knowing why, with CACHOO, the new long distance harmless snuff. Sent anywhere for 10c. 3 for 25c. 90c a dozen. Catalog included FREE.

P.T. & N. CO., Department B, Chicago, Ill.



LEARN *the* Greatest of Professions **BE A LAWYER**



Announcement

FOR over fifteen years the American School of Correspondence has been pre-eminent as a correspondence school of Business and Engineering. Its efficiency is recognized by professional and business men of the highest type. Its courses and consulting department are made use of by successful business men and engineers desiring to "polish up" on particular lines, as well as by thousands of young men who have obtained from this school their entire training for their life work.

The same resources and the same thorough methods which have been used in placing the business and technical instruction of this school on a plane by itself have now been directed to organizing a new

Department of Law

This Department is the result, not only of the American School's years of experience in teaching by mail, but of the closest study and analysis of the needs of the law student. The courses are written, not simply with a view to what students will buy and study, but with the idea of furnishing the *Best Correspondence Law Course* that has ever been offered or that it is possible to produce.

Instructors: The instructors of the American School are men pre-eminent in the various subjects they teach. Our instruction papers are prepared by the greatest living authorities, by men at the head of, or professors in the best resident schools in the country—*University of Chicago, University of Michigan, Wisconsin, Iowa, Illinois, Harvard, etc.*, men who are now engaged in teaching law at these great resident colleges.

Lincoln didn't have your chance— he studied law by the light of a pine knot and from books he borrowed. The American School brings a complete University Law Course to you in your own home; you won't have to quit work—just a small part of your spare time will do. All of our greatest statesmen and many of our most successful business men obtained their start through the practice or knowledge of Law. This is your chance to "learn the greatest of professions."

Special Easy Payment Plan. The American School is making a generous offer to every ambitious man. Just fill in and mail the coupon. We'll tell you how the school will lend you the amount of tuition and allow you to pay it back when the increase in your yearly income equals the amount of the loan. By this plan if you don't earn more money through the help of the American School, the school does not get paid for its services.

Why not make the start today by signing and mailing the coupon and allow us to tell you all about our special easy payment plan.

American School of Correspondence
CHICAGO, U. S. A.

Special Offer Coupon

American School of Correspondence, Chicago, U. S. A.

Gentlemen:—Please send me complete information regarding special "Deferred Scholarship" in Law Department, also complete Law Bulletin. Pop. Mech. 12-11

NAME.....

ADDRESS.....



THE IDEAL Christmas Gift

For the Wide-Awake American Boy

THE handsome set of four books illustrated above—"Mechanics for Young America" and the complete set of "Amateur Mechanics" up to date (Nos. 1, 2 and 3)—each book bound separately in Illuminated Covers, and the whole set enclosed in a heavy Bristol Folding Case with extension clasp—will be sent **\$1** prepaid to any address in the United States or the Postal Union for **\$1**.

These Books Are Thoroughly Practical and Instructive

"Written So You Can Understand It"

700

Articles giving every detail of
700 Things a Boy Can Make

1,000

Illustrations thoroughly explaining the Text

Besides telling how to make scores of things useful about the house, full and complete directions are given, easily understood, on constructing the following and hundreds of other things which appeal to the heart of every boy.

Electric Appliances—Steam and Gas Engines—Motors—Wireless and Morse Telegraph—Self-Propelled Vehicles—Toboggans, Bobsleds, Ice-Boats—Motorboats—Paddle Boats, Canoes, Rowboats—Camping Outfits—Cabins—Tents—Fishing Tackle—Magic Lanterns—Searchlights—Cameras—Telescopes—Gliders and Aeroplanes—Kites and Balloons—Aquariums—Electric Furnaces—Electroplating Outfits—Lathes—Foundry Work at Home—Iron, Copper, Brass and Other Metal Work—Bookbinding—China and Pottery Kilns—Parlor Magic Tricks, etc.

**Send a Dollar Bill Today and Get Ready to Make
Some Bright Boy Happy**

POPULAR MECHANICS BOOK DEPARTMENT

318 W. Washington Street, CHICAGO

DIAMONDS-WATCHES ON CREDIT

THIS ELGIN WATCH, 17 JEWELS, ADJUSTED,

Men's 16 Size, (also Ladies' O Size) Thin Model, New Marginal Minute Dial, in Gold Filled Case, Guaranteed for 25 Years, plain polished or handsomely engraved, sent prepaid on

30 DAYS FREE TRIAL

Then \$2.50 a Month

Our cut price of \$25.50 for this magnificent Elgin Watch, that will pass Railroad Inspection, is the greatest bargain ever heard of. **NO MONEY DOWN**—\$2.50 a Month after examination by you. Whether you are a railroad man or not, this is the Watch you want. No matter where you live, we will trust you. **Send us your order today.** Write for our Christmas Catalog, containing over 2,000 illustrations of Diamonds, Watches, Jewelry, Silverware, etc., for Christmas presents. It tells all about our easy credit plan.

LOFTIS BROS. & CO.

THE OLD RELIABLE, ORIGINAL DIAMOND AND WATCH CREDIT HOUSE
DEPT C894, 100 to 108 N. State St., CHICAGO, ILL.
Branch Stores: Pittsburg, Pa., and St. Louis, Mo.



No.

CHRISTMAS SPECIAL 364

No.
363

Christmas Special
LOFTIS "PERFECTION" RING
Finest pure white diamond
\$48 TERMS
\$4.80 A MONTH
Other sizes and styles at \$25,
\$75, \$100, \$125. See our
Catalog. Sent
Free.



This Morris Chair \$125

65c monthly—total price \$5.45. CASH
Latest design. Kiln dried heavy
stock. Genuine Fabricoid Leather. We
have 3000 such bargains for you. And all
SOLD ON CREDIT

You use and enjoy the goods now—pay as you can.
30 DAYS' GUARANTEED FREE TRIAL. Send us
once for our big illustrated catalogue. It's FREE
to you.

Spiegel, May, Stern Co.
1676 35th St., Chicago, Ill.

AGENTS—" \$80 IN 8 DAYS

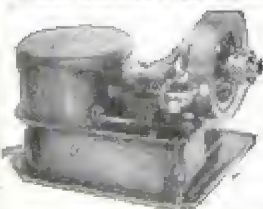
Working in the Noon-Hour Only."

That's the report of Mr. O. E. Warren,
one of our hustling representatives.
There is big money in selling Novelty Knives, Razors, etc. Trans-
parent handles with society emblems, photos, address, etc.
Quick sellers. Experience unnecessary. We teach you how. Exclu-
sive territory. Fine samples furnished to workers. Send no
money. Write quick—Today.

NOVELTY CUTLERY CO., 267 Bar St., CANTON, OHIO

TOOTHLESS SAWS—The employment of high-speed
revolving disks of mild steel for cutting hard steel has
become common, but the process always excites the as-
tonishment of the uninitiated. The disks are preferably
made of boiler-plate quality, and are about a quarter of
an inch thick. They revolve with a peripheral speed of
as much as 20,000 ft. a minute. One of these disks will
cut through a heavy channel section of hard steel, 12 by
6 1/2 in. in 15 seconds. It appears to act by local fusion.

The Little Hummer Power Plant 1/16 H.P.



Buy a real power plant, built as well as the
big ones. It will operate with perfect safety at
a pressure of 100 pounds or more, and it is the
only automatic steam plant of its size. Will
drive 25 watt dynamo, sewing machine or 4
inch emery wheel. Our "Baby" gasoline
engine will drive a 200 watt dynamo or a boy's
automobile. **\$16.00** Send for our Cata-
log. It sells for **\$16.00** logue and special offer
THE ELGIN WHEEL & ENGINE CO.
112-114 Douglas Ave. ELGIN, ILL.

New Sensation

THE BIGGEST SURPRISE OF THE AGE

**Photos Direct
on POST CARDS
NO NEGATIVES**



Hustlers and
wide-awake men
—the photo post
card business
offers unlimited
opportunities.

Small investment—
500% Profit. No expe-
rience needed. Be inde-
pendent—here is your
chance to start
your own busi-
ness. Big money
made at fairs, car-
nivals, amuse-
ment parks, etc., etc., with the

Mandel Combination No.3 Camera

This camera makes two style photos (sizes 3x4 1/2 and
2x3) **direct on the post cards without the use of nega-**
tives. "Complete portable photo gallery." Camera weighs
6 pounds. No dark room required—pictures made in broad
daylight and finished on the spot in one minute. Price
of Camera **\$17.50.**

COMPLETE OUTFIT ONLY \$26

Outfit includes everything needed to start making money
right away; also 100 large and 100 small post cards. Send
\$5 with order, bal. C. O. D. Write today for Free Circular.

CHICAGO FERROTYPE CO.

Dept. B102, Congress and Laflin Sts., CHICAGO

In Auto, Sleigh or Wagon on Cold Days Use a Clark Heater

It is neat compact, attractive and unbreakable; supplies the heat without flame, smoke or smell.
We make 20 styles of these heaters from 90c each to \$10. Most of them have attractive carpet
covers with asbestos lining. They have been on the market ten years and please every purchaser.
We guarantee that you will be pleased or
money refunded. They fit in at the feet,
occupy little space and are just the thing.

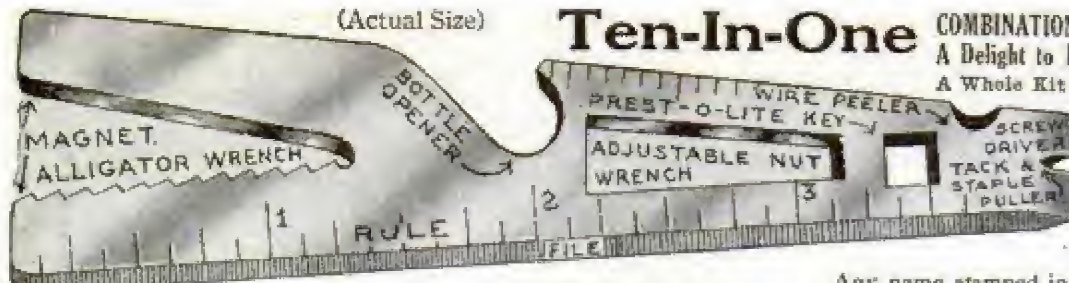
Don't Shiver and be Uncomfortable

when one of these heaters will keep you warm
and cozy and comfortable on every business or
pleasure trip in cold weather. Ask your dealer for
a **CLARK HEATER**—the only kind that will
last indefinitely, never get out of order, and heat
as much or as little as you want. Insist on the
CLARK. Write for complete catalog—a postal
will bring it. **WRITE NOW.**

CHICAGO FLEXIBLE SHAFT COMPANY, 105 La Salle Ave., CHICAGO



(Actual Size)

Ten-In-One

(Send one 2c stamp for our Treasure Box proposition)

SWEDISH-AMERICAN TELEPHONE CO.

Any name stamped in the metal 10c extra. Agents wanted. 1742-1750 Farragut Ave. CHICAGO, ILL.

COMBINATION POCKET TOOL of a Thousand Uses
A Delight to Everyone. A Beautiful and Sensible Gift
A Whole Kit of Tools in One Piece. Handiest and most useful combination tool ever made. Ten tools all in one piece and each of them of every day use to most everybody. Beautifully made of the finest case hardened steel, copper plated then nickel plated and highly polished.

Price 15 cents (stamps) each post paid to any address

WIN THIS \$1200

Thousands Already Won—Going on Daily

TEN PEOPLE GET \$40,000.00

They Tell You How to Win.

LISTEN! Stoneman (Nebr. photog'ph'r) actually received \$1200 one month, \$51.50 in 15 minutes, \$800 in 11 days; Korstad (Minn. solicitor) \$2212 in 2 weeks; Sevegne (N. Y. telegrapher) \$100 daily. Not a fairy tale, fake or humbug, but proven absolutely true by sworn statements. Government patronage, statesmen, judges, bankers, world's famed institutions, local references. Costs nothing to investigate. This gigantic money-making contest no longer controlled by a few—now open to any honest, industrious man or woman. Big money made by mechanics, clerks, farmers, teachers, doctors, lawyers, people from all walks of life. Experience, capital, business training unnecessary. You can own, operate and control same private enterprise that brought Wilson (banker) \$3,000 in 30 days; Rasp (agent) \$1685 in 73 days; Oviatt (minister) \$4,000; Rogers (survivor) \$2800; Juell (clerk) \$6800; Hoard (doctor) \$2200; Hart (farmer) \$5,000; Schleicher (minister) \$195 first 12 hours. Hundreds sharing similar prosperity—banking money, buying homes, automobiles. Don't wonder. Same appointment should mean same money for you—same power, prominence, dignity, respect, influence. Rise to big earnings, wage freedom, ownership and private monopoly. Knowing the reason dispels all doubt. Wonderful, but true.



M. Stoneman



M. Juell

STRANGE INVENTION

Strange Invention gives every home a bath room for only \$6.50; excels others costing \$200. Abolishes tubs, bowls, buckets, wash racks, sponges. Turns any room into a bath room with hot or cold running water. Think of it! So energizes water, one gallon ample; cleanses almost automatically; no plumbing; no water-works; self-heating. Gives cleansing, friction, massage and shower baths. So simple child can operate. Truly marvelous. A modern home-bathing without drudgery, inconvenience, mess of lugging water, filling tubs, emptying, cleaning, putting away. Could anything be more popular? Think of millions who want bath rooms! At eight people exclaim: "There, there, that's what I've been longing for." Little wonder Wilson sold 102 in 14 days; Hart, 16 in 3 hours. Think what you could do. Come—fall in line—make a fortune. Don't let another get there first. Your chance now to secure exclusive sale. Devote all or spare time. Means phenomenal earnings; no competition; fascinating, high-grade business. Credit given active distributors. Send no money—investigate first. Send to-day for remarkable offer—it's valuable but free.

"SEE IT ENERGIZE"

ALLEN MFG CO., 3382 Allen Bldg., TOLEDO, OHIO**DOUBLE THE FERTILITY OF YOUR FARM BY USING**

Red Cross Low Freezing DYNAMITE
To clear land of stumps and boulders, break up hardpan and subsoil, plant trees, dig ditches and many other uses about the farm. Free Booklet, "Farming with Dynamite" No. 248 sent on request.
E. I. DU PONT DE NEMOURS POWDER COMPANY
Established 1802 WILMINGTON DEL.

WHITE VALLEY GEMS IMPORTED from FRANCE
SEE THEM BEFORE PAYING!
These gems are chemical white sapphires—LOOK like Diamonds. Stand acid and fire diamond tests. So hard they easily scratch a file and will cut glass. Brilliance guaranteed 25 years. All mounted in 14K solid gold diamond mountings. Will send you any style ring, pin or stud for examination—all charges prepaid—no money in advance. Write today for free illustrated booklet, special prices and ring measure.
WHITE VALLEY GEM CO., 901 N Saks Bldg., Indianapolis, Ind.

VEST POCKET SNIP \$1.00

Prepaid

This powerful little compound lever snip cuts 18 gauge, accurately, easily. For electricians, sheet metal workers, dentists, jewelers, etc.
Prepaid for \$1.



AGENTS \$10 a day and more made selling this and our other high grade popular tools. Write quick for territory and new selling plan.

DETROIT SHEAR CO., 902 Greenwood Ave., Detroit, Mich.

The very high speed causes thousands of inches of surface to impinge in rapid succession on the metal undercut, so that its temperature at the point of contact becomes very high, although the disk, owing to its large surface area, remains relatively cool. All its frictional energy is con-

WHEAT MEERSCHAUM PIPES

Neat, attractive and ENDURABLE—absorbs all nicotine and ensures a cool, healthy, refreshing smoke. One puff from a WHEAT MEERSCHAUM gives more pleasure than ten from another pipe. Orders filled same day received. Money refunded if not satisfied.



Price Postpaid 45c each or 3 for \$1.00

THE FLOSS PIPE CO.

P. O. Box E152

Stamps Taken NASHVILLE, TENN.

HENS LAY AND PAY BY THE PHILO SYSTEM

FREE Booklet by E. W. Philo, entitled "A Little Poultry and a Living" or New 96-page book, "Making Poultry Pay," 10c. Both books and the new enlarged edition of the Philo System text-book, \$1.00, or all three books with our monthly magazine, Poultry Review, 1 year \$1.50.

E. R. PHILO, 8 Lake St., Elmira, N. Y.**ENGINES STEAM, GAS 1-8 H. P. up & GASOLINE**

Small Steam Boilers, Pumps, Dry Vacuums, Fans, Saws, Lathes.

Grinders, Phonographs, Stereopters, Postcard Projectors, Miniature Railway Equipment, Wireless and Electrical Novelties. Large catalog mailed for 15 cts. (coin preferred). Refunded on first order. No postals.

AMATEUR MECHANICS SUPPLY CO.
5150 219 S Dearborn St. CHICAGO, U. S. A.**THE BIGGEST MONEY MAKER**

A New Invention — "Vera-Breakless-Glass"

Make \$5.00 to Selling JOINLESS metal-frames with pictures fitted under VERA-\$10.00 per day BREAKLESS-GLASS. The assortments are of Landscapes, Figures, Religious pictures, also scenes and pretty Photo-Gravures, in finishes of Gold, antique copper, oxidized, brown and black. Guaranteed not to tarnish and the Glass Can't Break! We will ship a sample order of 12 assortments, size 4x5 1-2, each one in a separate box all ready to start in Business, for only \$1.00 PREPAID by merchandise-mail. This novelty has never been out, so be the First in Your territory; active agents wanted. Write for FREE illustrated Catalogue.
INTERNATIONAL METAL & FERRO. CO.
1282-64 Blue Island Ave., Dept. B, Chicago, Ill. Established 1891



BURROWES BILLIARD AND POOL TABLE

EVERY father and mother want to keep the boys at home nights, and would vastly rather have them bring their friends there to play Billiards and Pool than to meet them in the public poolroom, which often is merely the back room of a saloon.

Every young man wants to play Billiards and Pool—wants to play well. The Burrowes Home Billiard and Pool Table is scientifically constructed and adapted to the most expert play. Many of the leading professionals and experts of the country, including some of the champions of world-wide reputation, keep in practice by using a Burrowes Table at home. Every shot, every angle is true and correct, hence to learn or practice on a Burrowes Table means to become proficient on any table.

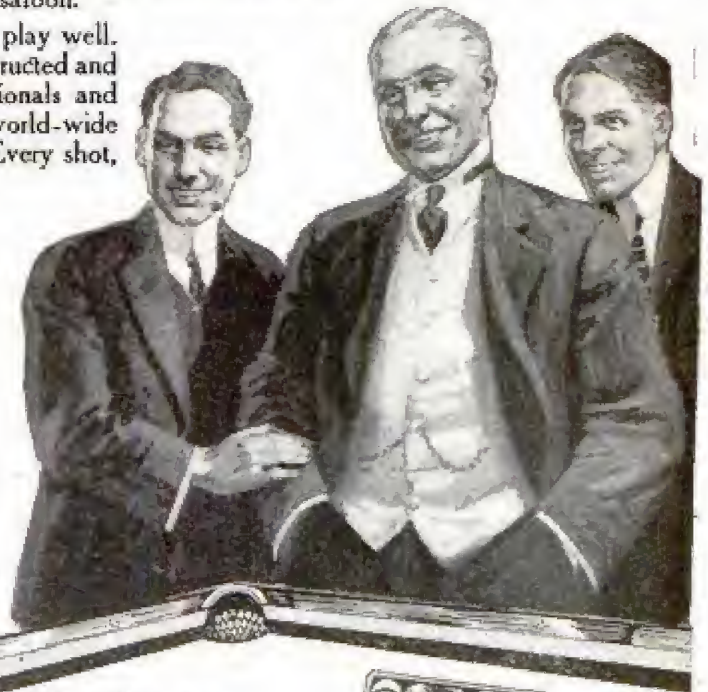
Burrowes Tables are made in sizes up to 4½x9 feet (standard), for rooms of different dimensions. They are easily set up, and quickly taken down and put out of the way. They may be set on dining-room or library table or mounted on their own legs or folding stand. All cues, balls, etc., free.

\$100 DOWN

We issue a nicely illustrated catalog describing all the Tables and fully explaining our easy payment plan, by which you can secure any Table worth from \$6 to \$15, for \$1 down and balance \$2 per month. Larger Tables for \$25, \$35, \$45, \$55, \$75, etc., on correspondingly easy terms.

FREE TRIAL—NO RED TAPE—On receipt of first installment we will ship Table. Play on it one week. If unsatisfactory return it, and on its receipt we will refund your deposit. Write today for catalog illustrating and describing the Tables, giving prices, terms of payment and all other information.

The E. T. Burrowes Co.
163 Spring Street,
Portland, Me.



Good. Dad, that's
Just what we wanted"

concentrated on an extremely small area of contact. The work is done so quickly that the heat has no time to spread in the metal undercut, and the sides of the cut portion are only a little warmed.—Keystone.

WHEN YOU WANT ANYTHING AND DON'T KNOW
WHERE TO FIND IT—WRITE BUREAU OF
INFORMATION, POPULAR MECHANICS, CHICAGO

TYPEWRITER FREE

for just a little of your spare time.

Hundreds write as follows:

Princeton, W. Va., June 12, 1911. "I earned my typewriter in one day."—J. W. Thorn.

Greenwood, S. C., June 12, 1911. "Earned my typewriter in a day and a half."—J. F. Phillips.

Tulsa, Okla., June 17, 1911. "I earned a \$100 machine for about thirty minutes talk."—Frank E. Harper.

Dayton, Ohio, May 23, 1911. "I earned my typewriter in just a few hours."—A. Highlen.

Ashley, N. Dak., June 8, 1911. "Earned my Emerson in not to exceed an hour, and consider it better than much advertised hundred dollar typewriters."—A. E. Snowden.

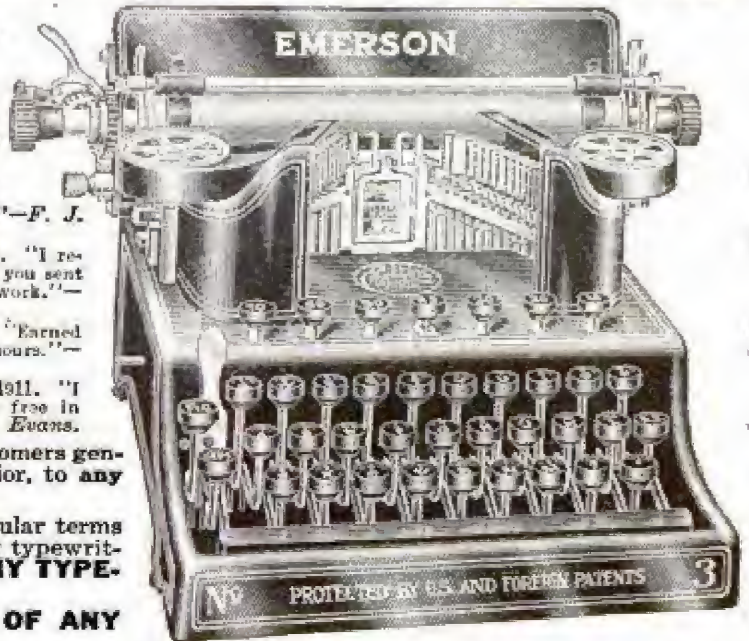
Lassater, Tex., Apr., 6, 1911. "I earned my Emerson Typewriter free in six hours."—O. S. Jones.

Hazardville, Conn., June 21, 1911. "I earned my Emerson free in not over two hours."—F. J. Barrett.

Biddford, Me., May 26, 1911. "I received the Emerson Typewriter you sent me free for less than a day's work."—C. M. Remy.

Rutland, Ohio, May 6, 1911. "Earned my Emerson free in about two hours."—L. E. Stevens.

Loveland, Colo., June 10, 1911. "I earned my Emerson Typewriter free in less than three hours."—W. J. Evans.



HUNDREDS WRITE THE SAME WAY and our customers generally pronounce the Emerson at least the equal, if not superior, to any \$100 typewriter on the market.

ONE DOLLAR down, then **Ten Cents** a day, are our regular terms and our present price, is but a fraction of what others ask for typewriters of like high-grade. **DON'T PAY EVEN \$20 FOR ANY TYPEWRITER, UNTIL YOU SEE OUR OFFER.**

BUT YOU CAN GET THIS TYPEWRITER FREE OF ANY COST for just a little of your spare time.

The Emerson is a high-grade, wholly visible typewriter, combining the high-grade, up-to-date features of all hundred dollar typewriters; rapid, accurate, light touch, easy action, wholly visible, two-color ribbon, universal keyboard, back spacer, tabulator, every improvement; the ideal machine for experts and beginners alike. With our instruction book you can write in an hour.

OUR FREE OFFER On a postal card or in a letter to us, simply say "Mail me your Free Offer" and by return mail, you will receive our latest Catalogue, illustrations, descriptions, endorsements, testimonials, certificates and our **FREE OFFER** by which **YOU CAN EARN AN EMERSON TYPEWRITER FREE FOR JUST A LITTLE OF YOUR SPARE TIME.** Address

THE EMERSON TYPEWRITER COMPANY, Box 190, WOODSTOCK, ILLINOIS



This is a picture of my big confectionery store in Springfield, Ohio

Popcorn Crispettes Built This Big Business —For Me—

I stand ready to help
other men to make
good; men who have
business hopes;
who are anxious
to make lots
of money.



The money I earned, selling Popcorn Crispettes—a new, delicious confection—enabled me to do it. My Popcorn Crispette Machine made me a rich man. Any other man who goes at it as I did can make a lot of money. I am just a common, everyday sort of a fellow. No reason why I should do any better than you. Write me today. I'll tell you how I built my big business. I'll tell you just how I went about it—how you can do the same.

If you follow instructions you should make more money this fall and winter than you ever dreamed of. Somewhere in your town there is a small store—a half-store or a little nook, or even a store window—where you can set up your machine and make money. You can start at home if you wish.

Every Time You Take in a Nickel You Make Almost Four Cents Profit

You'll have a good thing all to yourself. I furnish a secret formula for making Crispettes; it's different from anything else. So you escape competition. People buy and buy and buy Popcorn Crispettes because of the taste. They're so different—so tasty and tempting, folks want more and more of them. In my literature I tell you all about them; about men who have made big money with the machine, and the men tell you how they did it. It's very interesting reading. Making money isn't nearly as hard as it seems. Half of success is in making the start—the other half is nerve, judgment and a good proposition. I've got the proposition—you've got the nerve and judgment. Put the three together now and make money, as I did. At least investigate. Look into the proposition. Get my story, and the story of other men who are making money with a Long Popcorn Crispette Machine. Write today.

W. Z. LONG, 426 High St., Springfield, Ohio



==PUMPS==

For Well or Cistern Water
USE ANY KIND OF POWER

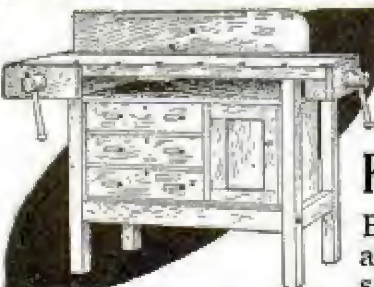
Automatic or Hand Controlled
We furnish Tanks, Fixtures, etc.

"JARVIS" 900 River Street
LANSING, MICH.

A Postal Brings Grand Free Millwork Catalog 5,000 Bargains in Building Material!

Send at once for the great Catalog of 5,000 Bargains in the highest grade Guaranteed Millwork and Lumber. Issued by the Largest Building Material Plant in America. Buy Doors, Windows, Mouldings, Stair and Porch Work—everything you need to build, remodel or repair—at 50 per cent saving! Quality, Safe Delivery and Satisfaction Guaranteed. (38)

GORDON-VAN TINE CO., 2714 Case Street, DAVENPORT, IOWA



Only \$14.50

For this Home Bench

Besides its convenience and usefulness, you will save its price in a year

by doing repair work and "fixing things" that you now pay a carpenter or repair man to do. Thousands of homes have home benches we have furnished—why not you?

Top is 50 in. long, 20 in. wide, with a 13-inch glued-up portion of thick maple

Grand Rapids Hand Screw Co.
620 N. Front St. GRAND RAPIDS, MICH.

Among deep-sea fishermen there is a comical idea that if a fly falls into the glass from which one has been drinking, or is about to drink, it is considered a sure and true omen of good luck to the drinker.—Fishing Gazette.

Spain makes only about 40,000 tons of paper a year, half of it for use of printers.—Chicago Daily News.

AUCTIONEERING Exemplifies the Highest Type of Salesmanship.

In the old days it often meant trickery. For seven years we have trained capable, competent, successful auctioneers. Send for Catalogue P. M. Jones National School of Auctioneering, 2868 Washington Blvd., Chicago.



LOTS OF FUN!! DOUBLE THROAT.

Invisible when in use. Astonish and mystify your friends. Whine like a puppy, sing like a canary, and imitate other birds and beasts of field and forest.

LOTS OF FUN. Thousands sold. Price, 10c each; 4 for 25c or 12 for 59c.

ELECTRIC FUN MAKERS, Dept. C. Kewanee, Ill.



Home Ironing Machine

On Easy Payments, 30 Days' Free Trial.

A heated mangle that irons all flat pieces better, easier, and in one-quarter the time. Costs 1c an hour for heat—gas or gasoline. Turned by hand, by power or by motor. "Clean Linen" booklet Free. Ask for it.

Home Ironing Machine,

311-F, Western Ave.
CHICAGO

You May Crowd a Crescent Jointer



to the limit of capacity and the machine will do work just as smoothly as though you had not crowded it at all.

Built in six sizes. Send for catalog telling all about them and describing our line of Band Saws, Saw Tables, Planers, Planers and Matchers, Shapers, Swing Saws, Boring, Disk Grinders, Variety Wood Workers.

THE CRESCENT MACHINE CO., 93 Columbia St., Leetonia, O.

This Engine Saves 3 Men's Pay 15-Day Free Trial to Prove It

PUT the wonderful **Perfection** portable kerosene engine in your shop—the difference in your pay-roll will soon cover its cost. Never gets sick, discontented or restless—just plugs away day in and day out doing the work of three men with never a complaint. Does a hundred things about the place quicker and better than manual labor could do them.

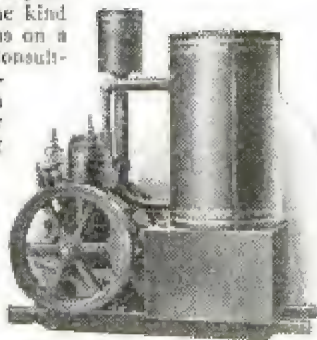
Perfection Portable Kerosene Engine

is the simplest, most compact engine made. That's because it's built by skilled automobile men, with years of engine experience. And the principle is *right*. The kerosene is drawn in a light film through the carburetor, vaporized and having the same energy as gasoline. And kerosene is from 6 to 16 cents cheaper than gasoline. The **Perfection** works equally well with gasoline, distillate or naphtha. **Call on your nearest dealer today—let him explain our great 15-day trial offer or write us direct for our big free engine book.** Sizes and types to suit every purpose.

FREE Advice on Power Problems

If you're in doubt about the quantity of power you can use profitably, or the kind of engine to buy, write your questions on a post-card and mail it to our Chief Consulting Engineer. He will give you, absolutely without charge or obligation to you, unprejudiced advice about your problems that may mean a big saving to you. Learn how easy it is to make a cheap transmission layout that will help you to run several machines at once with a single engine. Write today to

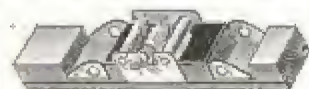
Chief Consulting Engineer,
Caille Perfection Motor Company
205 Second Avenue, Detroit, Mich.



Concrete and iron stairways are required by law in Cologne, Germany, in all buildings except single residences of two stories. It is officially stated that there has not been a dwelling house burned down for many years as there are no wooden structures in the city, and fires in most instances have been confined to one room.—Engineering Record.

Obey That Impulse Get a No-Equal Strop and Honing Machine

for Safety blades—if not, you are paying for one by buying new blades or having them sharpened. 4 blades will last one year, Absolutely guaranteed



PRICE, - - \$2.00

AGENTS WANTED

GOLDSMITH-WHITING CO. Goebel Bldg., DETROIT, MICH.

Ann Arbor

"INSTANTO"



**GASOLINE
LIGHTING
SYSTEMS**

Change from a 150 candlepower light to 2 candlepower in a jiffy. This latest and most perfect development of the gasoline lamp found only in Ann Arbor Lighting Systems. It gives the country home a lighting system as perfect, handsome and modern as city gas. Ann Arbor Lighting Systems are brighter than gas, steadier and clearer than electric light, and cost about one-tenth as much to operate. Each lamp gives 150 to 500 candlepower for less than 1/2 cent per hour. Fuel is gasoline; perfectly safe.

We make Complete Lighting Systems for Homes, Churches, Stores, Etc.

Prices, \$10 up, according to number of lamps desired.

We Want Agents who will push our line. A splendid opportunity right now for hustling agents in large cities to sell to owners of summer cottages, country homes and resorts. No other light can equal it in brilliancy, beauty of fixtures and economy. Sells on sight. Catalog and prices on request.

SUPERIOR MANUFACTURING COMPANY, 294 Second St., ANN ARBOR, MICH.



This Authoritative Book on the Science of **OSTEOPATHY** **ABSOLUTELY FREE**

More than 90 pages (profusely illustrated) containing complete and authoritative information concerning the theory and practice of Osteopathy, together with a full explanation of the profit and honor that comes to Practitioners of the Science of Mechano-Therapy (Drugless Healing); a Science far simpler and more comprehensive than Osteopathy—sent Absolutely Free to readers of "Popular Mechanics."

The possession of this remarkable book has opened the door of Opportunity to an army of ambitious men and women who desired to become Practitioners in the Science of Drugless Healing.

Thousands of successful Practitioners all over the civilized world attest to the ability of the American College of Mechano-Therapy, to educate men and women in class or by correspondence in this highly profitable and honorable profession. Eighteen millions of people in the United States today call in a Drugless Healer when they are sick.

Many of our graduates are averaging from \$10 to \$30 per day—and become proficient through studying only in their spare time in their own home.

The expert Practitioner in this Art and Science occupies an enviable position in the social and professional world—he is an expert in his knowledge of the Natural Laws of Drugless Healing.

The object of the College, in presenting you with this free text book on Osteopathy, is to enable us to more clearly define—to give you a more thorough understanding—of the Science of Mechano-Therapy (Drugless Healing). We gladly take the loss entailed by this presentation.

Send us two 2-cent stamps to cover postage. Fill in the coupon below carefully, and we will send you this book immediately, with our compliments. Address

AMERICAN COLLEGE OF MECHANO-THERAPY

Dept. 595

120-122 Randolph Street

Chicago, Ill.

CLIP THE COUPON NOW

American College of Mechano-Therapy,
Dept. 595, Chicago, Ill.

To the Dean:—Please send me, with your compliments, your large text book on Osteopathy, together with complete information regarding your course in the Science of Mechano-Therapy.

My Name is.....

My Address is.....

City..... State.....

The filling out of this COUPON entails no obligation whatsoever

Please Mention Popular Mechanics

This Genuine
1/4 Carat

DIAMOND RING

Direct
by mail
to you

\$16⁵⁰

As America's leading Diamond Importers, we make the above holiday offer to demonstrate our position in the Diamond market today. Send for this 14K. Solid Gold Diamond Ring, in which the diamond weighs 1/4 carat, fine color and perfectly cut, same size as illustrated, mounted in ladies' Tiffany or men's belcher settings. Take it to your own jeweler (we are perfectly willing that he should be the judge) and if he can duplicate it for less than \$25.00 send it back at our expense and your money (\$16.50) will be returned to you immediately without a quibble. Send slip of paper as measurement for size of ring around the finger.

Buy Diamonds Direct for cash (always with full cash refund guaranteed) and save usual retail profits or the extra profits those selling for credit must charge in order to make up for losses and the additional expenses of maintaining credit and collecting departments.



Our reliability is unquestioned. We refer you to any bank or newspaper in Boston.

JASON WEILER & SON

363 Washington St., BOSTON, MASS.

Direct Diamond Importers Since 1876. Wholesale and Retail Jewelers.
Foreign Purchasing Agencies: Paris, Antwerp and Buenos Ayres.

Write for Free Catalog of Diamonds (from \$10 to \$1000), Jewelry, and Watches. 19th Annual Edition just out.



Temco Electric Drills

Offer These Superior Features

Reverse movement of motor permits use of drill for Tapping.

Spindle lock permits tightening of drill in chuck without use of a key.

Capacity—from 0 to 3/4 in. in metal.

Weight—only 14 pounds.

And You Get Two Drills in One

Because our Drills can be used on Alternating or Direct Current interchangeably. Ask for descriptive booklet

THE TEMCO ELECTRIC MOTOR CO.

LEIPSI, OHIO, U. S. A.

THE STEPPING-STONE TO WEALTH



is the systematic saving of money. You and members of your family can easily cultivate this admirable habit by putting a dime in

GRAB'S KEYLESS BASKET BANK

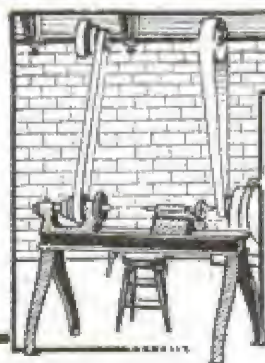
every day. Your money accumulates rapidly. Deposit of each coin registered automatically. Capacity \$30. Bank opens when \$5 or multiple thereof has been deposited. Cannot be opened otherwise. Made of solid steel, oxidized copper finish. Size 2 1/2 x 3 1/2 ins. Price \$1.00, prepaid in U. S. Money back if not satisfactory. An appropriate Xmas gift. Order NOW.

VICTOR M. GRAB & CO., 844 Ashland Block, CHICAGO, ILL.



Every Boy His Own Toymaker

Greatest boys' book ever written. Tells how to make a Steam Engine, Microscope, an Electric Telegraph, Telephone, Magic Lantern, Boats, kites, balloons, electrical and mechanical toys, traps, fishing tackle. 299 illustrations. Price only 10c postpaid, 3 for 25c. **ELECTRIC FUN MAKERS, Dept. 8, KEWANEE, ILL.**



READY

Shop Notes Year Book for 1912

224 Pages—612 Articles—510 Illustrations

Vol. VIII of the Series — Price 50c Postpaid



The tradesman in any line who desires to save himself the trouble of puzzling out the "kinks" and "short-cuts" of his occupation will find the Shop Notes Series of Year Books a veritable encyclopedia of

EASY WAYS TO DO HARD THINGS

They represent the valuable experience of expert engineers, firemen, carpenters, machinists, plumbers, painters, iron and wood workers, electricians, masons and other tradesmen.

200 Pages	Vol. I,	"Shop Notes for 1905"	385 Illustrations
228 Pages	Vol. II,	"Shop Notes for 1906"	555 Illustrations
228 Pages	Vol. III,	"Shop Notes for 1907"	580 Illustrations
212 Pages	Vol. IV,	"Shop Notes for 1908"	536 Illustrations
224 Pages	Vol. V,	"Shop Notes for 1909"	461 Illustrations
224 Pages	Vol. VI,	"Shop Notes for 1910"	451 Illustrations
224 Pages	Vol. VII,	"Shop Notes for 1911"	468 Illustrations
224 Pages	Vol. VIII,	"Shop Notes for 1912"	510 Illustrations

The low price of 50 cents a volume or \$4.00 for the 8 books in a handsome case, prepaid, places them within the reach of all as the set may be acquired gradually, one volume at a time, if desired.

Popular Mechanics Book Dept., 318 W. Washington St., Chicago

AGENTS WANTED FOR NEW INVENTION

A High Class Position for Good Man or Woman in Every Town and City. Can Earn \$5.00 Per Day at the Start, with Splendid Opportunities to Work Up. Write for Complete Information at Once.

I want good men and women everywhere, in unoccupied territory, who desire an honest opportunity. Let me say, therefore, that if you expect something for nothing, please do not apply for an agency; for this is not a get-rich-quick scheme, for you nor for us. I am not going to tell you that you can go into the business and make \$100.00 the first day. No such offer could be made in good faith by any responsible business house.

But if you are interested in a clean, high-class position that will pay you \$5.00 per day at the beginning, with good prospects ahead—if you are interested in laying the foundation of a permanent financial advantage through sound business policy, and in a straightforward, legitimate manner with a house of character and responsibility—then I wish you would send me your name and address and state the territory you would like to have. In case it is still unoccupied,

No charge is made for territory, and you are not required to buy a big stock of machines in order to get an agency. The essentials are that you obey instructions in the conduct of the agency, that you give your time faithfully to the business, and that you are honest. That is all.

A Local Agency of one town or county will be assigned to those who wish to confine their work to one locality, taking personal charge of all business in that field. No previous experience is necessary in conducting a local agency. Spare time work if desired.

A General Agency for Men and Women of Executive Ability

If you have had previous experience and are capable of taking charge of an extensive territory, I will offer you a General Agency, allowing you to appoint and instruct sub-agents, and give you management of several counties. This is an advanced position of high character and splendid opportunities for an extensive business and multiplied profits.

The Blackstone Water Power Vacuum Massage Machine is absolutely guaranteed. You take no risk. Only one agent will be given contract in a territory. The business is conducted strictly along business lines. Complete instructions are given, so that previous experience is not essential. I want good, honest men and women everywhere. The business is new. The field has not been touched. Write a postal card or letter at once, stating territory you desire. It costs you nothing to investigate, as complete information will be sent free. Address your communication to the Secretary.

THE BLACKSTONE MANUFACTURING CO., 282 Meredith Bldg., Toledo, Ohio.



The Blackstone Water Power Massage Machine. A New Invention.

The Blackstone Vacuum Massage Machine is a distinct achievement of modern invention. It is operated by simply running water. It slips on any faucet, and can be operated by any member of the family instantly and thoroughly. No cost of operation. Guaranteed against breakage. Endorsed by leading physicians and professional masseurs. With it you can enjoy a perfect vacuo-vascular scientific process of delightful, stimulating massage for face, scalp, bust or body. It is the home beautifier and health giver. It has captured the heart of woman and the earnest endorsement of man wherever its name and a description of its operation has been whispered. A handsome, illustrated booklet, entitled, "The Power and the Love of Beauty and Health," fully describing this wonderful new machine, sent free on application.

Price, complete, with applicators for face, scalp and body massage, also liberal sample of massage cream, sent by express prepaid to any part of the U. S. on ten days' trial, only \$5.00.

Through the Niagara Whirlpool

What Capt. Larsen Who Made this Dare-Devil Trip Says of His Scripps Motor:

"That's the second time I've gone through the rapids and come out alive. This trip was far worse than last year, and if my Scripps Motor had not run in perfect condition, I would not have lived to tell the story."

"Just before I started, I took a trial spin around below the falls. I found my engine working like clockwork, and immediately counted on a more successful trip than last year."

"When I struck the whirlpool, I knew at once that my life depended entirely on the power and the reliability of my Scripps Motor. The thousands who watched my trip know how nobly she responded."

CAPT. KLAUS LARSEN

The Most Remarkable Trip Ever Made in a Motor Boat

On October 29th, Capt. Klaus Larsen, of Detroit, performed the most remarkable feat ever achieved by a man and a marine motor. In his 15-foot motor boat Niagara, powered by a two-cylinder, 8-10 H. P. Scripps Motor, he made the seven mile trip through the Whirlpool Rapids at Niagara Falls.

Starting at the Maid-of-the-Mist landing on the Canadian side, Capt. Larsen arrived safe and sound 31 minutes later, at Lewiston, below the rapids, having accomplished in his small craft the seemingly impossible task of traversing safely the wildest waters known to the civilized world.

Just 23 minutes after the start, the intrepid navigator reached the big whirlpool. Skirting the edge of the pool, the boat was almost sucked, stern-first, into the swirling mass of logs and water. For half a minute, the boat hung on the edge of the pool motionless, but a moment later, the Scripps Motor asserted its power, and with a burst of speed, the boat darted into the swiftly flowing current below the pool. Never before has man, boat and motor so completely crowned themselves with glory. All through the trip, immense waves were dashing over the boat continually, but the water did not affect the gallant Scripps in the slightest. The Scripps Motor used was a regular model, two cylinders, 8 to 10 horse power. It was in no sense special, and you can have its duplicate, or any of its big or little brothers in your boat.

Scripps Motors are made in all sizes from one to six cylinders, 4 to 100 H. P. Our new catalog sent on request. Send for our Booklet "Through the Niagara Whirlpool with a Scripps Motor."

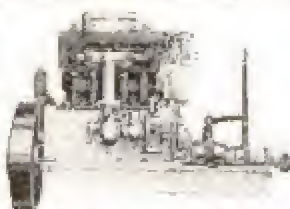
SCRIPPS MOTOR CO., 650 Lincoln Ave., Detroit, Mich.

"The Motor That REALLY DID Master Niagara"



CAPT. KLAUS LARSEN

WITH A Scripps Motor



GRUEN PRECISION VERITHIN WATCH

We put foreign watch makers to work on American ideas—

and the combination of this wonderful workmanship and ingenuity has resulted in a thin watch—made thin from the ground up—not cut down from a thick watch.

Half as thick as the ordinary watch, the Gruen—“Verithin” Watch has a beauty and grace hitherto impossible to obtain.

Write for our portfolio showing styles of cases and works with complete price list. Where we have no agent, we will see that you are supplied.

“Gruen-Verithin” for Men, adjusted grade: \$22, 25, 30, 35, 40, 50, 60.

In grades marked “Precision” on watch, \$40, 75, 85, 100, 125, 150, 250.

Gruen watches for women: \$16, 17.50, 25, 30, 40, 50, 75, with precious gems up to \$1200.

GRUEN WATCH MFG. CO.

55 Fountain Square, Cincinnati, O.

Manufacturers of the famous Gruen Watches since 1876

Factories in Cincinnati, Ohio and Maderhof, Switzerland



Gruen
Verithin

Quit Fighting Nature— Co-operate with Her

Why not enjoy the buoyancy of perfect health—why not be vigorous, active, strong, full

of energy? Why not have steady, responsive nerves—a clear, active mind—a bounding, vigorous circulation?

It's for you to choose. Vibration by means of the “Rex” Electric Vibrator puts all these things at your command. Vibration banishes disease and pain by banishing the cause. It brings perfect health by co-operating with Nature—something that medicines and drugs cannot do. Enjoy the wonderful benefits of Vibration in your own home by using the

“Rex” Electric Vibrator

Treatments with this wonderful machine are delightfully soothing, marvelously efficient. Its cost is negligible—its results positive and permanent.

Why not write today for our free book on Vibration, and name of nearest dealer demonstrating the “Rex.”

THE ROYAL SPECIALTY CO.

Largest Manufacturers of Vibrators in the World,
Dealers in all large cities.

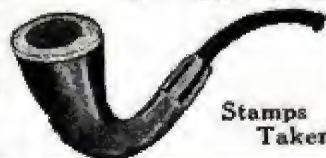
5102 St. Clair Ave.,

CLEVELAND, OHIO

Scotch Style Calabash Pipes

Why kill yourself by smoking a strong pipe? You can get a Scotch Calabash that absorbs all nicotine and poisons and ensures a cool, sweet smoke. Money back if you are not satisfied.

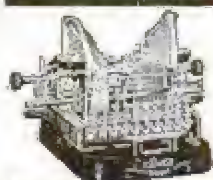
THE ROYAL PIPE CO.
243 Broadway, Nashville, Tenn.



Price 50c each, or
3 for \$1, postpaid

Stamps
Taken

Get the Agency Price on your TYPEWRITER \$50 Saved



Long time payments—
Free trial without deposit

Our sensational book, “Typewriter Secrets,” tells of a new Syndicate method of buying and selling typewriters that gives an astounding value.

Send your name and address on a postal-card—we will mail you a copy of this book free. It will tell you about the high prices—the reason for them. About the so-called rebuilt typewriters—the value of “second-hands.”

It will give you full information—the inside facts and make you a price on a standard typewriter that is lower than the best agency price—lower than the lowest wholesale price.

The book is a daring exposition of the typewriter situation. It's worth reading even if you are not now in the market.

TYPEWRITERS DISTRIBUTING SYNDICATE
159 EN, N. State St., CHICAGO

Wages are not high in India. A native switchman on a railway and the native servant in a private family receive seven rupees, or about \$1.90 a month. The farmhand receives four rupees, or \$1.08 a month. Wages vary in different sections, and there is a somewhat upward tendency in prices now. However, the missionaries told me that you paid about as much for labor in India as you do in America; that one man in America would do as much as a whole company in India.—Christian Intelligencer.

RIFLES and SHOT GUNS On Credit

This Accurate, Strong-Shooting,
Hammerless Shot Gun



PRICE \$17.50

\$4⁵⁰
DOWN

This high grade shot gun is fitted with Rummel's No. 14 Armory Steel barrels, full tapered choke, bored for either black or smokeless powder—12 or 16 gauge, 28 or 30 inch lengths, 7 1/4 to 8 pounds. Top lever action—hammers cock and throw safety automatically. Sent for \$4.50 Down and \$2.00 a month—no interest—no extras and you have 7 months in which to complete payment on this gun that will compare favorably with any \$40 or \$60 gun made. Every man wants a good gun, but not every man can afford to pay the full amount cash down—therefore, we have just lately decided to sell high grade fire arms on

CONFIDENTIAL CREDIT

If you want a guaranteed shot gun or rifle why not open a credit account. We have been selling high grade guns for thirty-five years. Write us for Complete Information and Catalog.

A. J. Rummel Arms Co., 127 St. Clair St., Toledo, Ohio

Finish Your Building in Winter Weather



Use Bishopric Wall Board in place of plaster and you can finish your building in winter as well as summer. You can save a month's time on your building.

There is nothing about Bishopric Wall Board to freeze. Goes right on rigid—solid—ready for paper, paint, burlap or wood panels. Makes handsomest walls, ceilings and partitions in largest and finest residences or cottages. Ceil your attic. Ceil your cellar. Finish your porch or any room with Bishopric Wall Board and you have the finest fire-resisting finish, proof against cold wind, dampness, rats or other vermin.

ings and partitions in largest and finest residences or cottages. Ceil your attic. Ceil your cellar. Finish your porch or any room with Bishopric Wall Board and you have the finest fire-resisting finish, proof against cold wind, dampness, rats or other vermin.

BISHOPRIC WALL BOARD

Better Than Plaster—Costs Far Less to Put On

Bishopric Wall Board is asphalt mastic (toughened asphalt) in which kiln-dried dressed lath are imbedded. Surfaced with strong, well-sized cardboard. **Asphalt Mastic does not burn.** The lath in Bishopric Wall Board makes it solid, rigid and flat, for all time. Cannot warp, swell or crack. **Lath is the only thing that gives wall board this rigidity, and Bishopric Wall Board is the only wall board made with lath.**

Bishopric Wall Board comes to you in sheets 4x4 feet, all ready to nail on the studs. Any man who can drive nails can put it on. Price, \$2.50 per 100 square feet; \$6.40 per crate of 16 sheets, 256 square feet, F. O. B. factories. Sold on Money-Back Guaranty.

Write for our Free Book and Samples of Wall Board Sheathing and Roofing. Address

THE MASTIC WALL BOARD AND ROOFING MFG. CO.
(2) 60 East Third St., CINCINNATI, OHIO

Deaf People Hear Whispers

With Common-Sense Ear Drums
—“Wireless Phones for the Ears”

For twenty years the Common-Sense Ear Drums have improved the hearing of hundreds of thousands of deaf people, and they will do the same for all who try them.

Every condition of deafness or defective hearing is being helped, such as Catharrhal Deafness, Relaxed or Sunken Drums, Thickened Drums, Roaring and Hissing Sounds, Perforated or Partially Destroyed Drums, Discharge from Ears—no matter what the cause or how long standing the case may be, there is hope of improved hearing for all the afflicted deaf.

The Common-Sense Ear Drum is made of a soft, sensitized material, comfortable and safe to wear. They are out of sight when worn, and easily adjusted by the wearer.

Good hearing brings cheerfulness, comfort and sunshine into the life of the lonely deaf.

Our Free Book, which tells all, will be sent on application. Write for it today to

WILSON EAR DRUM CO. (21)
297 Todd Building Louisville, Ky.



\$7.50

And You
Keep
This

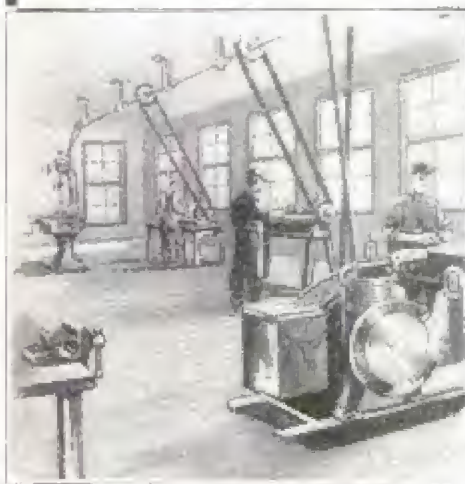


Great Engine

We will ship you Schmidt's Chilled Cylinder Gasoline Engine on your simple request without an order or any promise from you. You use the engine 10 entire days—use it all you please. Then, if you don't want it, send it back at our expense. If you wish to keep it, pay us only \$7.50 and you can pay the rest in the easiest monthly payments. Send coupon or a postal card for all particulars.

We Send This Engine Free

We do this to prove that the chilled cylinder is the simplest and most economical engine ever built. We want you to see for yourself that it is better than any other engine that costs twice and three times as much. It is the only engine with the marvelous, powerful chilled cylinder. The engine with a spark retarder. The new type gasoline engine that has revolutionized the gasoline engine industry. The only engine good enough to send out on actual free trial to sell itself. Write for free catalogs.



Ten Days Free Trial

This is the first genuine free trial ever offered on a gasoline engine for farm and shop use. We want you to see that women and children can run this engine. Use the engine to run your pumps and any machinery you have.

Take a Long Time to Pay

If you like this engine after trying it out for 10 whole days you can keep it and take a long time to pay for it on easy monthly payments. Schmidt's Chilled Cylinder Gasoline Engine is absolutely guaranteed five years in every part. The biggest bank in Iowa backs our \$1000 challenge offer on our engines. Write to us promptly for particulars and we will send you our valuable book, "How to Use Power" free.

FREE BOOK COUPON

Schmidt Bros. Co.
Engine Works
Dept. 1199
Davenport, Iowa

Schmidt Bros. Co.
Engine Works

Department
1199

Davenport
Iowa

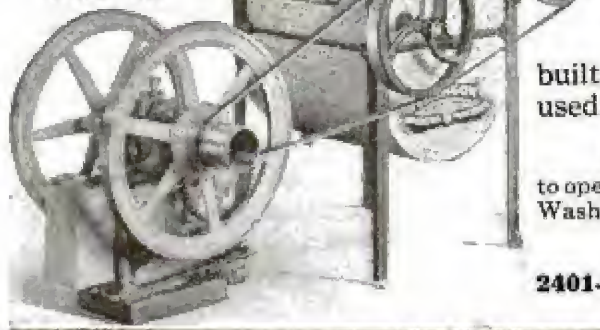
GENTLEMEN:—Please send me description of the wonderful Chilled Cylinder Gasoline Engine, also your book, "How to Use Power," also Schmidt Bros. catalogs and full particulars of your free trial and easy payment plan. All free and postpaid.

NAME

ADDRESS

23⁷⁵

AND UP



AN IDEAL HOME LAUNDRY

Get our Sanitary and Up-to-date

ALL-METAL PARAGON POWER WASHER

built on the Famous Revolving Cylinder principle so successfully used in all modern Hotels, Institutions and Steam Laundries.

USE YOUR ENGINE OR ELECTRIC MOTOR

to operate both Washer and Wringer and relieve wife or mother from the awful Washday Drudgery. Write for our "Practical Home Laundry Catalog" No. 1.

PARAGON MFG. CO.

2401-3 W. 14th Street

Mfrs. of Washing and Ironing Machines and Wringers for Domestic Use

CHICAGO, ILL.

SHORTHAND AT HOME—BY MAIL

We Can Teach You In Thirty Days

The most profitable profession in the world is open to you right now. Through our perfected methods we guarantee to teach you perfectly, right at home, by mail and in only 30 days. Not an experiment but a proven success that has stood the test of time.

BIG MONEY—GREAT OPPORTUNITIES

No matter who you are or what you are doing—*shorthand will help you to success*. As a profession it is interesting, profitable and gives you a real short cut to opportunity. **Now write** for our valuable book FREE, "Shorthand in 30 Days." *Get the facts*. Learn the truth about this marvelous new system which is 50 years ahead of any other known method. Send for the FREE book now. (16A1)

CHICAGO CORRESPONDENCE SCHOOLS

1248 Chicago Opera House Block

CHICAGO

A New Book

Pattern-Making

By G. H. WILLARD

With Additional Chapters on
Core-Making and Molding

224 Pages, 312 Illustrations, Cloth Cover

Price \$1.00 Postpaid

"Written So You Can Understand It"

A book for the man who has to do the work. Written by a practical pattern-maker of many years' experience.

Chapter Headings

I. Pattern-Making as a Trade. II. The Tools. III. Woods. IV. Joints. V. Turning. VI. Turning (Continued). VII. Turning (Continued). VIII. Turning (Concluded). IX. The Circular Saw. X. The Circular Saw (Continued). XI. Machine Tools. XII. Machine Tools (Continued). XIII. Simple Patterns. XIV. Simple Patterns (Continued). XV. Simple Patterns (Concluded). XVI. Crooked Patterns. XVII. Large Pattern Work. XVIII. Large Pattern Work (Continued). XIX. Crosshead Guide Patterns. XX. Sweep Work. XXI. Pipe Work. XXII. Stove Pattern Work. XXIII. Molding—Machine Work. XXIV. Molding Pattern Work.

Part II—Core-Making and Molding

Chapter I. Core-Making, Simple and Complex. II. Principles in Molding. III. Loam Patterns and Loam Molds. *Every one following this trade, or intending to learn it, should have a copy of this valuable book.*

Published by

Popular Mechanics Co., Chicago

HURRAH! No More Expense for Me

HAVE YOU A SAFETY RAZOR?

THEN WHY NOT A PARAMOUNT STROPPER

The simplest and most practical Stroppler ever invented, no automatic parts to get out of order, sharpens all makes of Safety Razor Blades to perfection in less time than it takes to tell. Sharpens both edges of Gillette Blades at one time, makes one blade do the work of a dozen, saving TIME, TROUBLE and MONEY. It enables you to get a clean, smooth shave without scratching or scraping the face. For sale everywhere or mailed on receipt of 50c. STOREKEEPERS AND AGENTS WRITE

PARAMOUNT MFG. CO., 815 World Bldg., New York

AMERICA'S GREATEST CREDIT HOUSE FURNISHERS

will send Free their great Book—*Secrets of low prices* and Easy credit on everything you want.

STRAUS & SCHRAM, 1201, 35th St., CHICAGO, ILL.

WHEN YOU WANT ANYTHING AND DON'T KNOW WHERE TO FIND IT

WRITE BUREAU OF INFORMATION,
POPULAR MECHANICS CHICAGO

A New Book that is Needed

POWER GAS and the GAS PRODUCER

By J. C. MILLER, M. E.

An Authentic Text Book and a Complete Reference Manual Covering Every Detail of Installation and Operation.

"Written So You Can Understand It"

192 Pages Price \$1.00

For the Steam User. This book will enable the Steam User to judge intelligently as to the economy and advisability of changing from Steam to Producer operation.

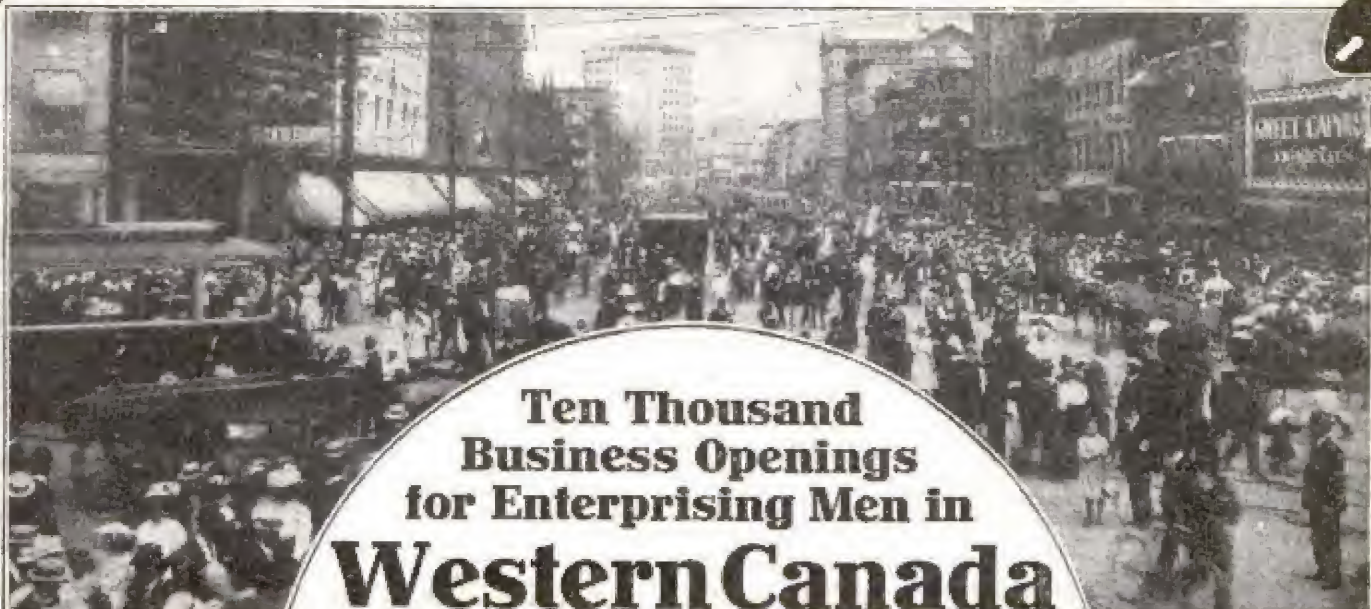
For the Steam Engineer. It will enable the Steam Engineer to understand thoroughly the working of the new system if the change is made, and to handle a plant competently and with confidence.

Profusely Illustrated. Extra Cloth Binding.

Sent postpaid to any address by the publishers

POPULAR MECHANICS CO.

318 W. Washington Street, CHICAGO



Ten Thousand Business Openings for Enterprising Men in Western Canada

Merchants, Manufacturers, Homeseekers, Investors

—Men and Women who work with hands or brains—are you alive to the opportunities the last and most favored West offers? In Western Canada millions of virgin acres are being plowed; railways are being built; villages, towns and cities are springing into existence; a nation is being made. No matter where you live or what your business or employment may be; no matter whether you have few or many dollars, or whether you are a young man, a man of mature age or a self-supporting woman, your big opportunity is in the Canadian West. Your big opportunity is in one of the new, or yet unborn,

100 Grand Trunk Pacific Towns

The year of 1913 will see the completion of this great Transcontinental Railway with its more than 8,600 miles of main and branch lines. Hundreds of towns are being established along this railway, and it is the purpose of the Railway Company to make these towns the leading ones of the Canadian West. You are invited to become a partner of the Grand Trunk Pacific Railway in this great work. Those who have already taken advantage of this lifetime opportunity are profiting. In 1910, in a Grand Trunk Pacific new town of less than 500 population, one Implement Dealer did a \$90,000 business; one General Store sold \$63,000 worth of goods; a Hotel did a \$47,000 business; a Lumber Yard did a \$70,000 business.

In another, property which was bought from the Grand Trunk Pacific Railway for \$325.00 sold in less than a year later for \$1,442.50. In the same town another man made a net profit of \$1,075.00 on one lot within a year. In eleven hours, July 11 and 12, 1911, \$251,648.00 was invested in Mirror, Alberta, property. A month later 25 business enterprises were established in Mirror.

These are typical instances of what is being done in these towns. An average of two new towns a week are being placed on the map of Western Canada. Each offers some special inducement to industrious men and women. You owe it to yourself to learn more about these opportunities. Send one of the coupons below, hand the other to an ambitious friend; **"Chain of Opportunities"** both of you will receive

—a book of interest to all who desire to become identified in some way with the onward movement of Western Canada. Through its authorized Agents the Grand Trunk Pacific renders a valuable service by pointing out the best towns and opportunities for merchants, manufacturers, investors. To those who desire to engage in business, build homes or invest their savings or surplus, the Railway Company offers Grand Trunk Pacific townsites property at nominal prices, on easy terms if desired. Ask questions—tell us what you want to do—discuss your case fully and frankly; you will in no way be obligated. To send the coupon will cost you nothing—may gain you much. Address

G. U. RYLEY, Land Commissioner GRAND TRUNK PACIFIC RAILWAY

Room 312, Union Station, Winnipeg

or Transcontinental Townsite Company, Ltd., Authorized Agents
268 Portage Avenue, Winnipeg, Canada

(10)

**Send
This to
a Friend**

G. U. RYLEY

Land Commissioner
Grand Trunk Pacific Ry.
Room 312, Union Station
Winnipeg, Canada

I am interested in the opportunities offered by Grand Trunk Pacific Railway new towns.

**Mail
Coupon
Today**

G. U. RYLEY
Land Commissioner
Grand Trunk Pacific
Railway
Room 312, Union Station
Winnipeg, Canada

I am interested in the opportunities offered by Grand Trunk Pacific Railway new towns.

Name.....

Street No.
or Rural Route.....

Town..... State.....

Name.....

Street No.
or Rural Route.....

Town..... State.....

How and Where To Buy Land On Moderate Income Book Free



HERE'S a wonderful book absolutely free to you who are ambitious to own rich land. You, who are land hungry, yet have only a limited means to satisfy that hunger. This book tells about the marvelously productive "Winter Garden Farms" —right in the heart of the leading winter truck growing, orange grove and fruit ranch section of the U. S. It is a book that will seize you with a firm grip, and hold your interest at white heat because it is "The Key to Success." I defy any ambitious man or woman, clerk, stenographer, salesman, mechanic or teacher—any professional or business man to weigh this book and find it wanting in Opportunity.

Winter Garden Farms

Here's land for you within ten miles of New Orleans at a remarkably low price, value considered—within ten miles of the second seaport of America, the basic point of American import and export trade.

For—bear in mind that the Panama Canal will be completed in 1913. Do you know what this means? Listen to Theodore Roosevelt who said on March 11, 1911:

"I doubt if any of us realize the change in the trade of the world that will come about upon the opening of the canal. There is no other part of the country that it will mean quite as much to as the gulf states, and above all, to the city that sits at the mouth of the great river. With the opening of the Panama Canal, there will be a great impetus to the growth of New Orleans."

Now, this powerfully interesting book which we want to send you free, shows you why great railroads and industrial interests are staking their millions on New Orleans, and you, too, reader, though not a capitalist, may share in this sure and rapid development.

It tells how, on small monthly payments you can own a Winter Garden Farm that will pay you a guaranteed interest of six percent on your money yearly, and also one-half value of crops right from the start, and how, in a few years, this opportunity should make you independent for life, owing to the sure and steady increase in the value of this land.

If you can visit me personally, so much the better; in any case, send for this book at once.

J. ARTHUR DIXON, Secretary

New Orleans Netherlands Company
1321 First National Bank Building Chicago, Ill.

CANADIAN FARMS

Do you want a farm in Western Canada where the crops this year are in advance of anything grown on this continent? For wheat-growing, dairying, mixed farming and cattle-raising, the Province of Alberta is unsurpassed.

Lands are now offered by the CANADIAN PACIFIC RAILWAY COMPANY at prices ranging from

**\$10 to \$30 an Acre on Long Terms
of Payment or on the Crop
Payment Plan**

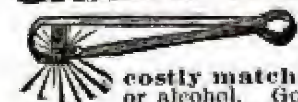
—that is, paying for your farm with a portion of your crops each year.

Land values have increased 30% in two years.

Great opportunities for the Homeseeker. Call or write for full particulars, booklets, maps, etc.

G. E. THORNTON, General Agent
Canadian Pacific Railway, Alberta Land Dept.
112 West Adams St., CHICAGO, ILL.

GRAB'S WONDER LIGHTER!



Everybody's buying it. The safest, most efficient and economical substitute for dangerous and costly matches. Flashes instantly, igniting any gas or alcohol. Good for 5,000 lights. A household necessity. Simple, durable. Price prepaid only 10c. Think of it. Hurry order. Agents wanted.
VICTOR M. GRAB & CO., 116 Ashland Blk., Chicago, Ill.

This \$25⁰⁰ Morris Chair — This \$15⁰⁰ Library Rocker
\$12⁵⁰ **\$10⁵⁰**

FREIGHT PAID
GENUINE LEATHER
CUSHIONS \$7.50
EXTRA



CHOICE OF
8 FINISHES

WITH REVERSIBLE
CUSHION

FREIGHT PAID
GENUINE LEATHER



CUSHION
\$2.50
EXTRA



Better Furniture at One-Half Less

By getting Home Craft Furniture you save factory selling and finishing costs, excessive freight charges, all jobbers' and retailers' selling costs and profits and secure *Guaranteed Furniture*, in purest Mission designs — Hand Made entirely from Clear Quarter Sawed air and dry kiln seasoned White Oak — the best in the world. Shipped in sections that fit together as easily as a set of building blocks. You do finishing yourself. All materials furnished. Can you imagine anything more practical for a family Christmas gift?

DROP POSTAL for HOME CRAFT CATALOG

showing and describing the beauties of Home Craft Furniture, advantages in buying Home Craft and full details of the Home Craft Guarantee and Money-Back Selling Plan.

THE HOME CRAFT COMPANY
3304 North Avenue MILWAUKEE, WISCONSIN

FREE UPON REQUEST

OUR

Valuable 96-Page Catalogue

OF THE

Best Mechanical Books

It is well worth having and
keeping for reference.

Popular Mechanics Book Dept.

318 W. Washington Street, Chicago

THE INDEX

TO VOL. XVI

**Popular Mechanics
Magazine**

(July to December, 1911, inclusive,) is now ready and will be mailed to any address upon receipt of 10c in stamps.

POPULAR MECHANICS CO.

318 W. Washington Street, CHICAGO

The Automatic Pistol Dissected in This New Book

SEND today for a copy of "It Banishes Fear," a new book.

It tells you more on the subject of automatic pistols than you'd be able to get out of days of grubbing in a library.

It tells of the difficulties in the way of designing and making a *dependable, accurate, powerful* pocket automatic, and of the simple and logical way in which each separate problem has been solved in the construction of the SAVAGE.

For the design of the SAVAGE prevents the jamming of cartridges and shells during rapid fire—the thing that makes automatics so unreliable and dangerous. The SAVAGE positively *controls* the cartridges during the operation of the mechanism so that they *cannot* jam. The booklet tells how.

The SAVAGE locks its breech while the bullet is passing through the barrel. This prevents escape of gas at the breech and insures perfect accuracy and high uniform velocity.

The SAVAGE "safety" is really safe. There is no danger of discharge from shocks and jars when the pistol is carried loaded and cocked.

And the SAVAGE grip is famous. This gun is so built that it conforms perfectly to the anatomy of the hand and wrist, so that it really "aims as easy as pointing your finger" and shoots straight in the dark.

There are a hundred more things you can learn from this book. Send today and we will also send you a copy of "The Tenderfoot's Turn."



FAMOUS SAVAGE RIFLES

SEND also for a book which explains about the famous 303 Savage Featherweight, \$25, and the 22 cal. Takedown Repeater, \$10. Free for dealer's name, Savage Arms Co., 3412 Savage Ave., Utica, N. Y.

THE NEW SAVAGE AUTOMATIC



There's a Carborundum Stone For Every Sharpening Need

For the Carpenter, the Mechanic, the Man-about-the-house, the boy in the manual training school, the housewife in the kitchen,—Carborundum means sharper tools and better work.

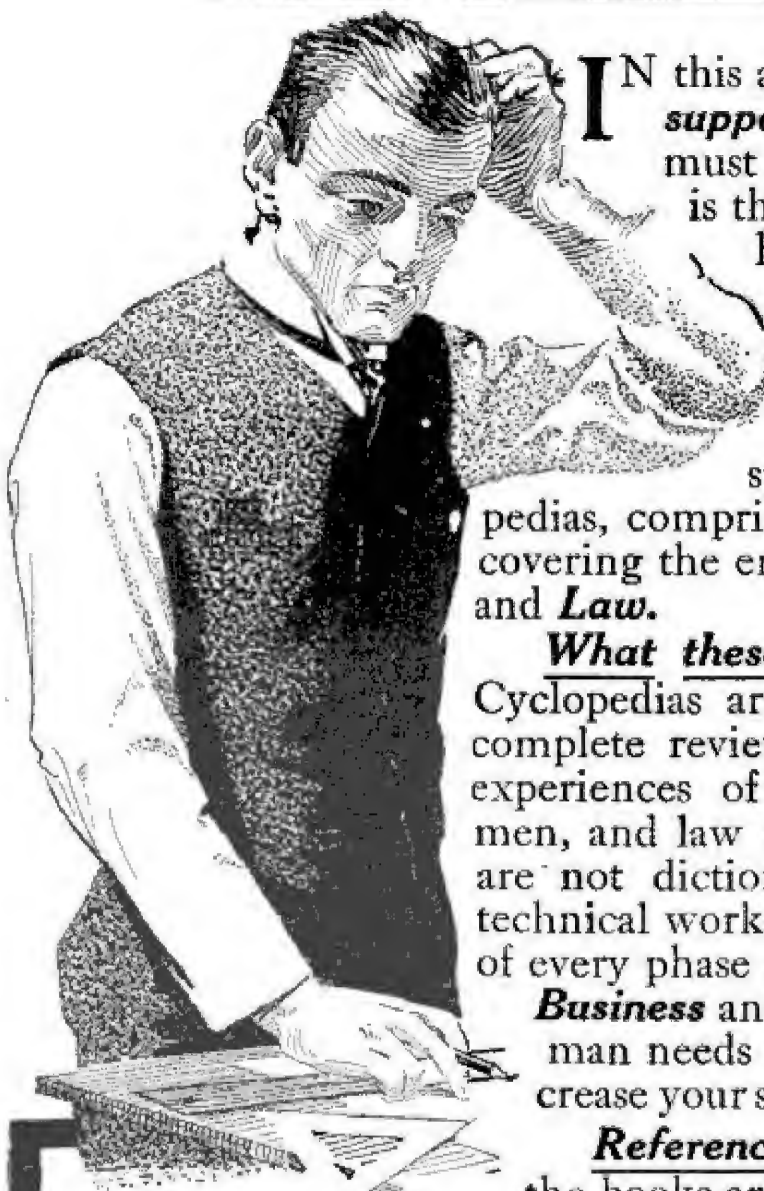
Carborundum Sharpening Stones are on sale at hardware stores everywhere—If your dealer does not have them, send direct.

No. 107-H	Round Combination Stone for Carpenters	\$1.00
No. 108-H	Oblong Combination Stone	1.25
No. 78-H	Knife Sharpener—Oblong, Stag Handle, in neat box	1.00
No. 131-H	Sportsman's Stone—Round, in pigskin case with strap for attaching to belt	1.00
No. 149-H	Pocket Stone in cardboard case . . . . .	.15

Sportsmen will be interested in the book—"How the Doctor got his Bull Moose"—A true story—it's free.

THE CARBORUNDUM COMPANY
NIAGARA FALLS, N. Y.

The world makes way



IN this age of efficiency you can't **guess**, or **suppose** or **think** a thing is right—you must **know**. The man who does know is the man who is marked for success—he is the man the good job seeks—he is the man who gets the money—he is paid for what he knows—not for what he does.

The American School of Correspondence publishes fourteen Cyclopedias, comprising over ninety complete volumes, covering the entire field of **Business, Engineering** and **Law**.

What these Cyclopedias are: These great Cyclopedias are not collections of theories, but complete reviews of the actual, tried and tested experiences of the greatest engineers, business men, and law experts in the world. The books are not dictionaries of disjointed facts—not dry technical works, but clear and simple explanations of every phase and every branch of **Engineering, Business** and **Law**. They are books that every man needs in his library—books that will increase your salary by increasing your knowledge.

Reference value guaranteed by the fact that the books are compiled from the textbooks used in the correspondence courses of the American School of Correspondence. These practical lessons are arranged for quick reference, and the new cross index enables you to turn to any subject in an instant.

We prove their value to you by sending the set you select on approval. If the books are not all we claim them to be—and more—do you think we could afford to take this chance?

No chance for you to lose—no deposit required—no transportation to advance—nothing to pay unless the books are just what you want.

Another Great Free Offer

With each set we include a Consulting Membership entitling you to the advice of our Engineering, Business, and Law experts absolutely free of charge. This will give you practical help in handling problems which are too specific to be taken up in detail in the Cyclopedia. There will be no limit to this service. A single problem solved for you might be worth more than the first cost of the books. Order the books you need now. Don't wait until you actually need them, then it's too late. These books answer every question in Engineering, Business and Law—quickly and accurately.

for the man who knows

Remember — It costs you nothing to examine the books — you will save money by owning them. Mail the coupon — make your final decision with the books before you.



Engineering, Business and Law

Cyclopedia of

American Law and Practice (ready Jan. 1st)	12 vols.	\$39.80
Commerce, Accountancy and Business	10 vols.	24.80
Architecture, Carpentry and Building	10 vols.	24.80
Civil Engineering	8 vols.	19.80
Applied Electricity	7 vols.	19.80
Mechanical Engineering	7 vols.	19.80
Engineering	7 vols.	19.80
Automobile Engineering	4 vols.	12.80
Fire Insurance	4 vols.	15.80
Motion Picture Work	2 vols.	9.80

Don't let a few cents a week stand between you and the books you need every day. Pick out the cyclopedia you want, fill in and mail the coupon. We'll send you the complete set **free of charge.** You can keep the books a week and examine them at your leisure. We will do all this just to prove to you the superiority of the American School's Cyclopedias over all others. We want you to examine the books thoroughly, critically; subject every formula and problem to the severest test you know. Then, if you are satisfied the books are just what you want, send us the first payment of \$2.80 and \$2.00 (Law \$3.00) a month until you have paid the special price mentioned above.

When filling in the coupon be sure and mention the Cyclopedia wanted.

AMERICAN SCHOOL OF CORRESPONDENCE
CHICAGO, U. S. A.

* **FREE EXAMINATION COUPON** *

* American School of Correspondence, Chicago, U. S. A. *

* Please send me set of Cyclopedia of..... *

*
* for 7 DAYS' FREE examination. I will examine the
* books thoroughly and if satisfied, will send \$2.80
* within 7 days and \$2.00 (Law \$3.00) each month until
* I have paid the special price of \$.....
* If I decide not to keep the books, I will notify you at
* once and hold the books subject to your order. Title
* not to pass to me until the books are fully paid for.

*
* NAME

* ADDRESS

* EMPLOYER

* REFERENCES

* Pop. Mech. 13-11

**Little Things
that Make a
Big Winner**



L. C. Smith & Bros. Typewriter

(BALL-BEARING, LONG-WEARING)

Typebar ball-bearings made like a watch. Carriage, to move at a feather touch and stand at any point, unshakeable. Escapement, lightning swift, in its get-away from the operator's nimble fingers. Touch, smooth, easy, with snappy response. Shift-key lightened to one-third ordinary pressure.

Careful, painstaking application to such fine details of construction have given you a typewriter that gets *big results* and does satisfactory work—all kinds of it—without a bit of fuss or needless effort.

Your stenographers will like the L. C. Smith & Bros. Typewriter because it enables them to do better work, do it easier, and do more of it. You'll want it, yourself, for the same reasons and also because, on account of the ball-bearings throughout, it keeps in better order and gives much longer service.

Branches in all
large cities

L. C. Smith & Bros.
Typewriter Co.

Head Office for Domestic and Foreign
Business, Syracuse, N. Y., U. S. A.

Send for "Another Decision
by Experts" telling how the
Savage Arms Company chose
a typewriter equipment.

No Better Christmas Present for \$1.50

than a year's subscription to

Popular Mechanics Magazine

containing nearly 4000 illustrations
and 2000 pages of reading matter.

Much of it Interests Everybody.

Most of it Interests Anybody.

All of it Interests Somebody.

Order through your newsdealer or address the
publishers, POPULAR MECHANICS, CHICAGO

A CHANGE

Under a new plan effective April 1,
1911, our street number is changed to

318 W. Washington St.

The change in address is caused by
a re-numbering of the streets and
is not a change of location. Please
address our mail to the new number.

Popular Mechanics Magazine

Here
Xmas
Idea



No. 14

Jack Knife
Safety Pen,
sterling
silver.
Price \$8.00.
Same pat-
tern, 18-K.
gold, heavy
plate, \$6.00.



No. 57

Gold—
New
design.
Price
\$12.00

No. 20 1/2

Chavil
barrel.
Price \$0.50

No. 47

Gold and
pearl.
Price \$10.00

No. 33

Gold
fillings
Price \$5.50

Give Pens Only— Parker Gift Pens

and Settle Christmas Shop-
ping Easily, Inexpensively

THE new Parker Gift Pens are made specially for Christmas and come in beautiful gift boxes.

They are jeweled with diamonds, emeralds, rubies, and other gems, and are ornamented with gold, silver, and pearl, in all manner of beautiful designs.

And there are Parker carved pens, plain pens—every kind of handsome gift pen—to suit all tastes, all pocketbooks. Prices, \$1.50 to \$250, according to size and ornamentation.

Why fatigue yourself selecting different gifts? Go now to your stationer, jeweler, drug or department store, ahead of the Christmas crowd, and pick out Parker Gift Pens suitable for everybody. Dealer will hold them until Christmas week, without charge.

Every Parker Gift Pen comes in a handsome box of special Christmas design.

EVERYONE WANTS A PARKER PEN

if he has no fountain pen. If he has one, he wants a Parker, because his old one leaks and the Parker won't leak.

Prove that it won't. Unscrew any Parker Pen. Drop some ink into the curved feed tube. Touch curved end to barrel, as in test picture, and

WATCH THE INK SCOOT DOWN

This is what happens in the Parker every time you put it in your pocket, point up. *Capillary Attraction*, the same Force that draws oil up a lamp wick, draws ink out of the Lucky Curve feed tube.

If feed tube were straight—as in other fountain pens—it would still be full of ink when point up in your pocket. Result: The *air* in the barrel expands from the *heat* of the body and forces the ink up and out over writing end of pen.

DON'T GIVE LEAKY, MUSSY PENS

Before you buy, unscrew the pen. If it hasn't a curved feed tube, don't buy it. It will leak. If the store hasn't Parkers in stock, ask clerk to get an assortment for you to select from. He will, if you insist. If he *won't*, then send to us for catalogue, and we'll fill order direct.

PARKER JACK KNIFE SAFETY PEN

is a great gift, for it can be carried in pocket or purse, in any position, and still not leak. \$2.50 up.

All Parkers write smooth as glass. Have 14-K. gold Iridium pointed pens. New Parker Disappearing Clip never lost a pen yet. Avoid Christmas crowds. Examine Parker Gift Pens at dealer's today.

Parker Pen Company, 100 Mill St., Janesville, Wis.

Our New York Retail Store is at 11 Park Row,
opposite Post Office.

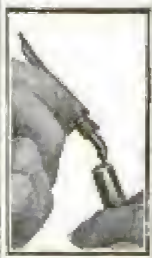
PARKER

LUCKY CURVE

FOUNTAIN PEN



X-ray
view
of
Parker
Fountain
Pen.



Make
this test
yourself



CHIEF DRAFTSMAN

Will INSTRUCT PERSONALLY a limited number selected, ambitious men in

Practical Drafting, Detailing, Designing

Draftsmen Drawing \$125-\$150 Monthly

Are NOT MADE in Schoolrooms,
Are NOT MADE by reading books,
Are NOT MADE by making Copies,
Are NOT MADE at home drawing pictures
from printed book lesson.

LET ME TELL YOU:

It requires actual, practical, up-to-date
DRAFTING-ROOM WORK to train YOU
to gain the PRACTICAL EXPERIENCE
that your employer will demand of you.



FREE

This \$13.85
**DRAWING
OUTFIT**

and **Free Position.**

As Chief Draftsman of Engineering firm I know exactly the Quality and Quantity of PRACTICAL training, knowledge and actual up-to-date experience (not school knowledge) you must have, in order to obtain a good position and advance to highest salary.

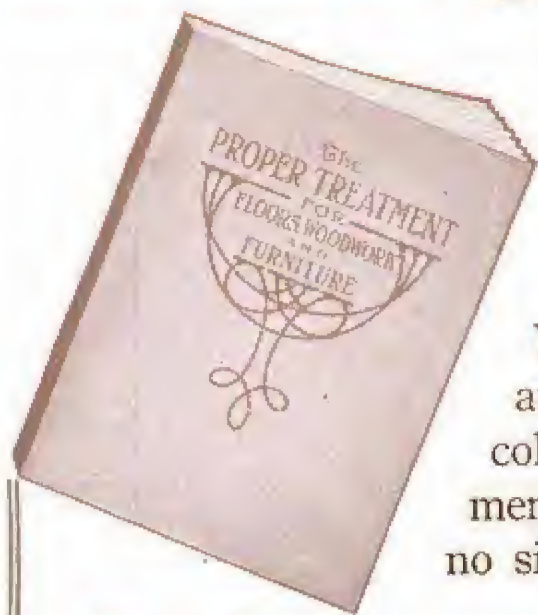
I give **INSTRUCTION UNTIL COMPETENT** and
PLACED in POSITION at above Salary.

DON'T waste TIME and MONEY trying to learn from books or printed "STUFF" you can only learn on PRACTICAL WORK which I furnish you.

Address **CHIEF DRAFTSMAN**
Div. 19, Eng's Equip't Co. (Inc.), Chicago

FREE

A Book of Valuable Ideas for Beautifying the Home



WE will send you *free* of charge our book "The Proper Treatment for Floors, Woodwork and Furniture," two sample bottles of Johnson's Wood Dye and a sample of Johnson's Prepared Wax. This text book of 50 pages is very attractive—80 illustrations—44 of them in color. The results of our expensive experiments are given therein. There is absolutely no similarity between

Johnson's Wood Dye

and the ordinary "stain." Water "stains" and spirit "stains" raise the grain of the wood. Oil "stains" do not sink below the surface of the wood or bring out the beauty of the grain. Varnish "stains" are not stains at all. They are merely surface coatings which produce a cheap, shiny, painty finish. Johnson's Wood Dye is a dye. It penetrates the wood; does not raise the grain; retains the high lights and brings out the beauty of the wood.

**For artistic coloring
of all woods in the
following shades:**

No. 126 Light Oak
No. 123 Dark Oak
No. 125 Mission Oak
No. 140 Early English
No. 110 Bog Oak
No. 128 Light Mahogany
No. 129 Dark Mahogany
No. 130 Weathered Oak
No. 131 Brown Weathered Oak
No. 132 Green Weathered Oak
No. 121 Moss Green
No. 122 Forest Green
No. 172 Flemish Oak
No. 178 Brown Flemish Oak
No. 120 Fumed Oak

Johnson's Prepared Wax

will not scratch or mar. It should be applied with a cloth; dries instantly—rubbing with a dry cloth gives a velvety protecting finish of great beauty. It can be used successfully over all finishes. We want you to try Johnson's Wood Dye and Prepared Wax at our expense. Fill out the attached coupon being careful to specify the shades of dye wanted. We will mail you promptly the booklet edition P. A. 12 and samples. Do not pass this page until you have mailed the coupon.

S. C. Johnson & Son
Racine, Wis.

"The Wood Finishing Authorities"

..... Please Use This FREE COUPON
I accept your offer of Free Booklet Edition P. A. 12 and two sample
bottles of Johnson's Wood Dye. Send me shades Nos. and
..... and one sample can of Johnson's Prepared Wax.
NAME.....
ADDRESS.....



LAW

Study At Home

WE MAKE YOUR HOME A UNIVERSITY



ADMINISTRATION BUILDING

President Taft says:

"Every man who expects to achieve substantial success in the business or professional world should be legally trained."

NO need to give up your present occupation or go away to school. Give us your spare time and we can thoroughly instruct you in business or professional law. Graduate correspondence students hold the highest records and are most successful in passing bar examinations. This is the **leading home-study law course in America**, and is so recognized by the highest legal and educational authorities. Our own modern text, shown above, were lately prepared by Deans and Professors from many of the leading resident university law schools—Harvard, Univ. of Chicago, Michigan, Wisconsin, Illinois, Iowa, Leland Stanford, and others. We offer the only course which is in accordance with the instructions of professors actually engaged in teaching the law at the big resident colleges. Do not overlook this important fact.

We guarantee to coach free any graduate failing to pass bar examination.

FREE The books shown above are furnished without additional cost to all students enrolled in either the business law or full university law course. This magnificent law library—the complete 14 volumes—are sent to the student just as soon as enrolled. A very small fee covers your first payment. No entrance examinations.

17 CENTS A DAY is all the course will cost you under our new easy payment plan. We mean exactly what we say. Write today and get the particulars.

Legally trained men achieve the greatest success in business and public life. Abraham Lincoln, Edward H. Harriman, Thos. F. Ryan, Robert S. Lovett, John Mitchell, Samuel Gompers, John F. Dillon, and thousands of our most noted men and lawyers have studied law without attending a resident college.

DECIDE NOW TO STUDY LAW and thus make the first step toward a great and successful business or professional career. Extremely low cost—**EASY MONTHLY PAYMENTS.**

OUR GREAT OFFER

Greatly reduced scholarships offered at this time to secure a large enrollment quickly. We reserve the right to withdraw offer at any time, so send in coupon right away and secure full particulars of the most remarkable offer made by an institution of learning.

SPECIAL BUSINESS LAW COURSE

for those desiring a knowledge of commercial law. Remember, the law books shown in this ad become the property of the student and are sent as soon as you are enrolled. These books are full standard law size, containing over 6,000 pages of reading matter and citations to over 15,000 cases. As fine a law library as student, business man or lawyer could wish for. Know your legal rights; keep out of law suits.

SEND COUPON TODAY

Don't wait until the offer is withdrawn and it is too late.

LA SALLE EXTENSION UNIVERSITY, Box 1199, CHICAGO, ILL.

Free Coupon

LaSalle Extension University,
Box 1199, Chicago, Illinois

GENTLEMEN: Please send at once, particulars and complete catalog **FREE**, regarding Special Advertising Scholarships offered in your Department of Law.